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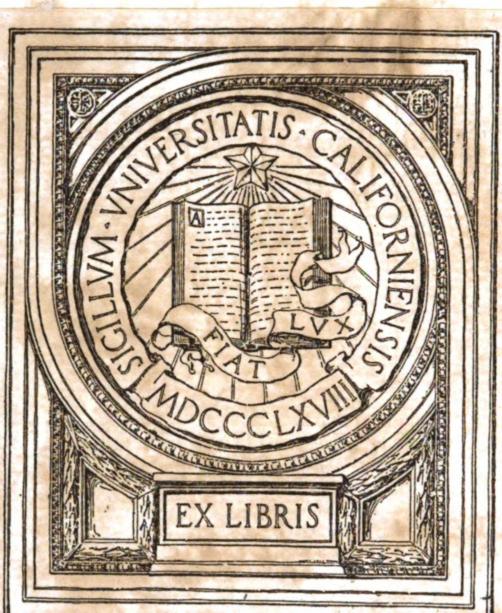
Bulletin

Illinois. Board of Live Stock Commissioners



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State
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BULLETIN No. 1, SEPTEMBER 1910

Hog Cholera
and Serum Vaccination

STATE HOUSE
SPRINGFIELD, ILLINOIS

UNIV. OF
CALIFORNIA

SPRINGFIELD, ILL.:
ILLINOIS STATE JOURNAL CO., STATE PRINTERS
1910

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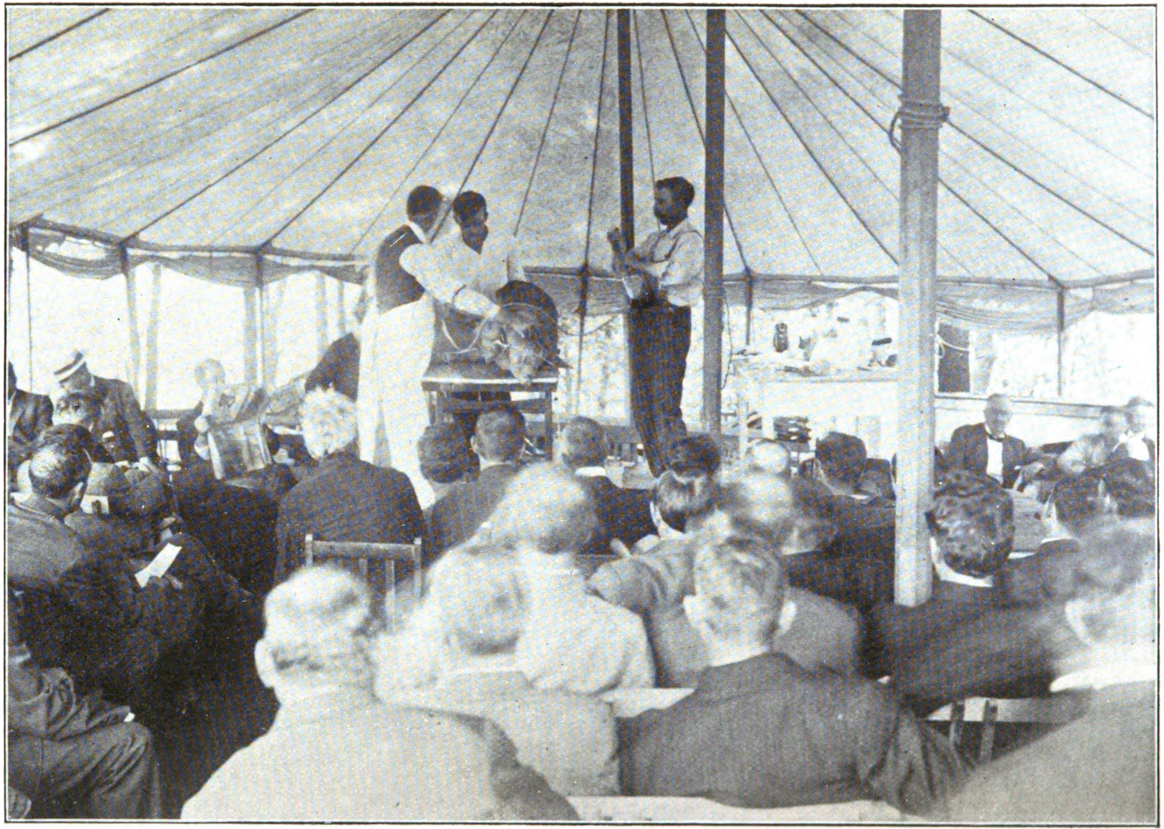

Making a Hyper-immune before a class of veterinarians.

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HOG CHOLERA.

(A. T. Peters.)

There is probably no disease that is of such economic importance to the stockman as the one now under consideration. Hog cholera is really not a new disease. It was reported by the Bureau of Animal Industry in Ohio as early as 1833, and then made its way to other states along the line of commerce, until today it has invaded nearly every part of this country where swine are grown. The losses from this disease are very large. Every state loses annually many thousands of dollars from this disease.

Symptoms.

Unfortunately the symptoms of hog cholera are not constant. It is therefore very difficult for the best informed to positively diagnose hog cholera from symptoms. Hogs that suffer from other causes, especially intestinal troubles, present symptoms that very closely resemble those of hog cholera. The symptoms are, usually, great weakness, drowsiness, and constipation followed by diarrhoea. The animals lie quietly in a corner, huddling together, usually hiding the head in the litter. The hair becomes harsh and dry. The eyes become watery and locomotion becomes weak and irregular with imperfect control of the hind legs, resulting finally in paralysis. The skin around the flanks and forelegs may become purple, the skin of the ear frequently becomes inflamed, and in the latter stage has a scabby appearance and may result in part of the ear dropping off. The animals refuse to move when disturbed, and are more or less lifeless. There is usually a loss of appetite, but in some rare cases the appetite may not be affected. In chronic cases there is a rapid emaciation which is accompanied by extreme nervousness or paralysis of the hind limbs. The cough is usually short and hacking. In the chronic cases we usually find diarrhoea a few days before death. There is considerable redness around the nose, ears, and abdomen, and this usually increases as death approaches. These symptoms may vary and therefore it may become necessary to await the post-mortem and bacteriological examinations before making a final diagnosis.

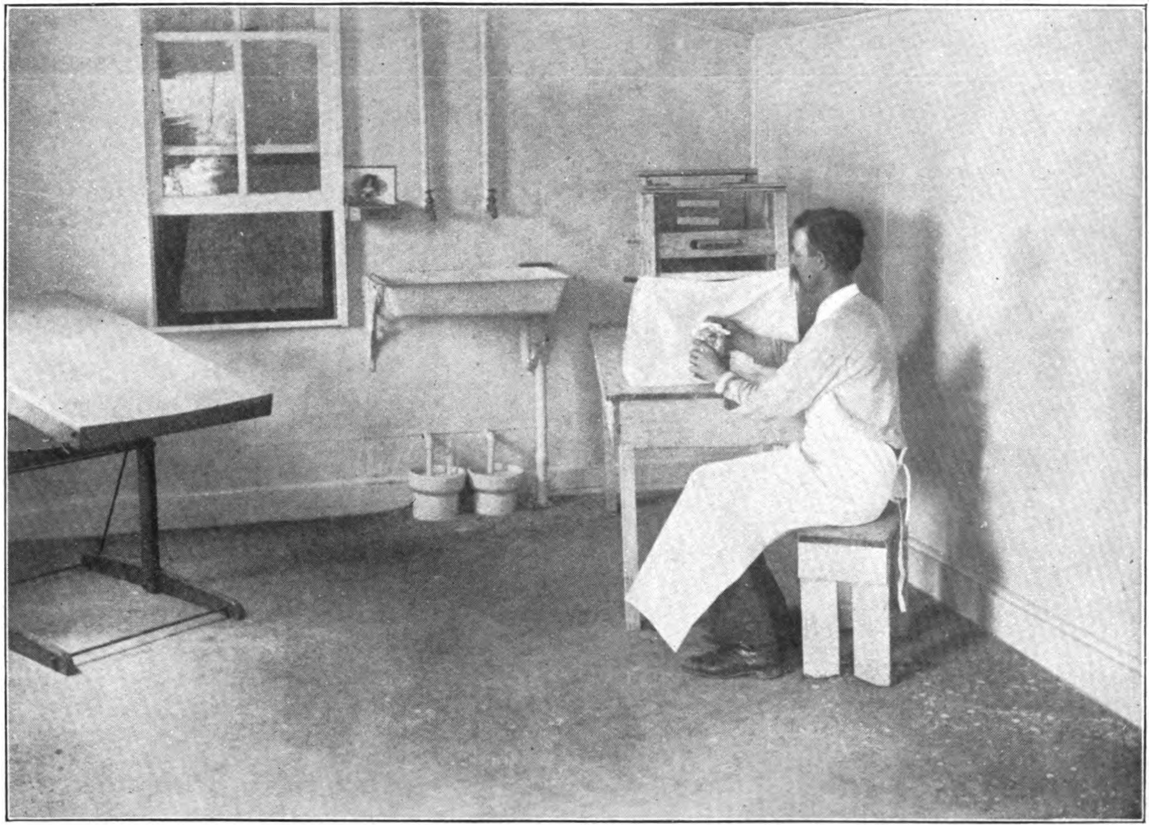
Post-Mortem Appearances.

The post-mortem examination reveals the most important changes in the large intestines. The mucous membrane of the large and small intestines is red and swollen, and is dotted with dark yellow and black ulcers, which are so deep that they may penetrate the walls of the intestines. The pancreas is swollen and somewhat caseous. Ulcers are found on the tongue and larynx. In some cases the lungs are inflamed. The spleen is enlarged, soft, and gorged with blood. It may be many times as long as the normal spleen. The lymphatic glands are usually affected. The kidneys are usually the seat of extensive hemorrhagic changes. Chronic cases of hog cholera are distinguished from tuberculosis by the fact that in hog cholera the diphtheritic patches in the intestines do not calcify but become caseated on the edges, and dry and brittle in the center, while ulcers in tuberculosis calcify.

When the respiratory organs are the seat of the disease, the pleural cavity will contain a greater or less quantity of serum, which in some instances will be flaky as a result of coagulation. The pleura may present all the characteristic appearances of pleuritis. In some cases the lungs become hepatized to a greater or less extent. The exudate found in the air cells and bronchial tubes will vary in color and usually presents a frothy appearance. The trachea and larynx frequently present inflammatory appearances. The pericardium which covers the heart is almost always found congested, and contains more or less serum. The lymphatic glands are usually involved. Usually two kinds of pneumonia are found, lobar and catarrhal. The nature of the lung disease will depend to a large extent on how the virus gained entrance. If it entered by way of air tubes it is more likely that we shall have a bronchial pneumonia. If it entered the lung tissue through the circulation, then we shall have more or less scattered pneumonia.

Treatment.

For hog cholera there is no sure cure, and therefore preventive measures should be used. A great deal of good can be done by good sanitary regulations and by good feed. Feeding balanced rations that supply all the nutriments that the animal requires, will aid in warding off these diseases. It is of great importance to remember that the disease is caused by distinct germs and is highly contagious; therefore one should bear in mind that they can be warded off by preventing the bacteria from gaining entrance on the premises, and for this reason one should avoid visiting on a farm where he has any suspicion that hogs are dying from one cause or another, and above all should avoid purchasing a hog or hogs from a herd in which animals have recently died, for in that way he will bring the disease on his farm. Animals should not be thrown into streams, and the streams should be carefully guarded so that they will not be the source of spreading this disease through a great part of the country. It is known that virus can be carried on



Method of drawing blood from an hyperimmuned hog.

feed, implements, and shoes and clothing of the attendants who are taking care of the hogs. Dogs, buzzards, and the like can carry this disease. A dog from a neighbor should not be allowed on the farm when there is any suspicion of hog disease on his farm. As soon as the disease is noticed in a herd, it is well to divide the herd carefully into two or more groups. In this way you may check the disease and not lose more than one group, and prevent it from occuring in the rest of the herd. It is needless to say that these pens should be kept thoroughly clean, using such disinfectants as lime water or corrosive sublimate. When an animal has died, the carcass should be immediately burnt. It is not advisable to bury the carcass of cholera hogs, for very often a few years after they have been buried, hogs may have the opportunity to root them up, and in this way a fresh outbreak of cholera may occur. It is known that after hogs have been buried for a period of eight to twelve years, when that ground was brought to the surface it was still capable of producing hog cholera. The premises should be thoroughly disinfected. All dirt should be removed from the pens. The manure can be taken directly to the fields and plowed under, but should not be left exposed near the hog pens, for this is often the source of reinfection a year later. After all the dirt and litter has been removed, use one pound of carbolic acid crystals in about four gallons of hot water and thoroughly spray the woodwork with this solution, and then give it a coat of whitewash. Be careful not to turn hogs that have recovered from hog cholera in with the rest of the herd too soon; several months should elapse before doing this. Quarantine each hog that you purchase for at least three weeks, and during the time that he is in quarantine it is well to disinfect him thoroughly, either by spraying or dipping him several times before allowing him to be with the herd. Be careful to avoid all communication with any one who you suspect has been in cholera pens, or on a farm where hogs suffer with some disease, no matter what name they apply to it.

The treatment of sick animals should be as follows: Above all, avoid too much feed while the animals are ailing, keep the troughs clean, do not allow the food to become sour, giving them just as much as they will clean up. As stated, there is very little that can be done with medicinal treatment, but by separating the sick from the well, and feeding the well ones sparingly, keeping plenty of disinfectants before them, and feeding very little to the sick ones and keeping them quiet, beneficial results will follow.

Hog Cholera Vaccine.

Immune hogs from which you wish to obtain serum may be prepared for bleeding in three different ways, that is by the slow method, by the quick method, and by intravenous injection. After a hog has been treated by one of these methods, it is known as an hyperimmune. The slow method consists in giving the hogs three increasing doses of virulent blood, which is injected under the skin, at intervals of seven to ten days. It takes about a month to produce an hyperimmune by the slow method. The quick method consists in injecting a very large amount of diseased blood at one time. The intravenous method consists in injecting virulent blood in small doses into the vein. These hogs are ready to be bled a week after the close of the preparation treatment.

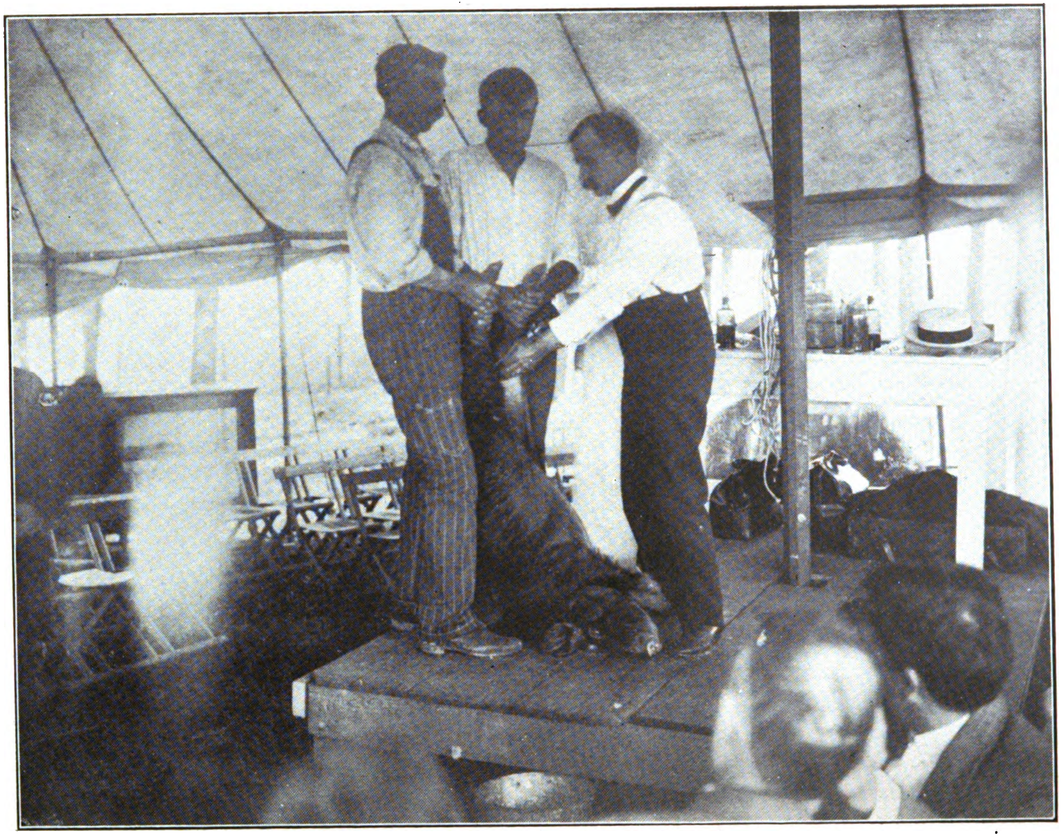
The hog, after being placed on a table, is washed and then the tail is thoroughly washed with an antiseptic solution and lukewarm water and soap, and then with a weak solution of alcohol. Before preparing the hog, bottles are sterilized and covered with cloth, which has also been sterilized. The entire rump is covered with a cloth, so that no dirt can fall into the bottle. A piece of the tail is amputated and in this way the blood is drawn from the hog. From a hog weighing 150 pounds, about three pints of serum is obtained at one bleeding. A hog can be bled four times before he has to be hyperimmunized again. The blood received in this way is defribrinated, and a small amount of carbolic acid is added to preserve it, and yet not injure its protecting power. The blood is then ready for use. A hog weighing 150 pounds will yield from 90 to 100 doses of vaccine at one bleeding. A hog can be bled once every eight or ten days. The above methods of preparing the vaccine are according to the Government directions.

Hogs may be protected against hog cholera by two different methods: (1) by the serum-alone method, and (2) by the serum-simultaneous method. The serum-alone method is used mostly on sick herds, and has only a limited protective power. It produces immediate but only a temporary immunity. However, if the animal is exposed to the disease during the treatment, the period of immunity is prolonged. and in some cases for life. In the serum-alone method we use from 20 to 30 cc. of serum, obtained from a previously hyperimmunized hog, as described above. The injections are made with a hypodermic syringe under the skin (subcutaneously) and into the muscle tissue, preferably on the inside of the thigh and high up towards the body. Before injecting the serum the syringe and also the vessel containing the serum is sterilized, and the thigh is washed with a 2½ per cent solution of carbolic acid, or with one of the coal tar dips.

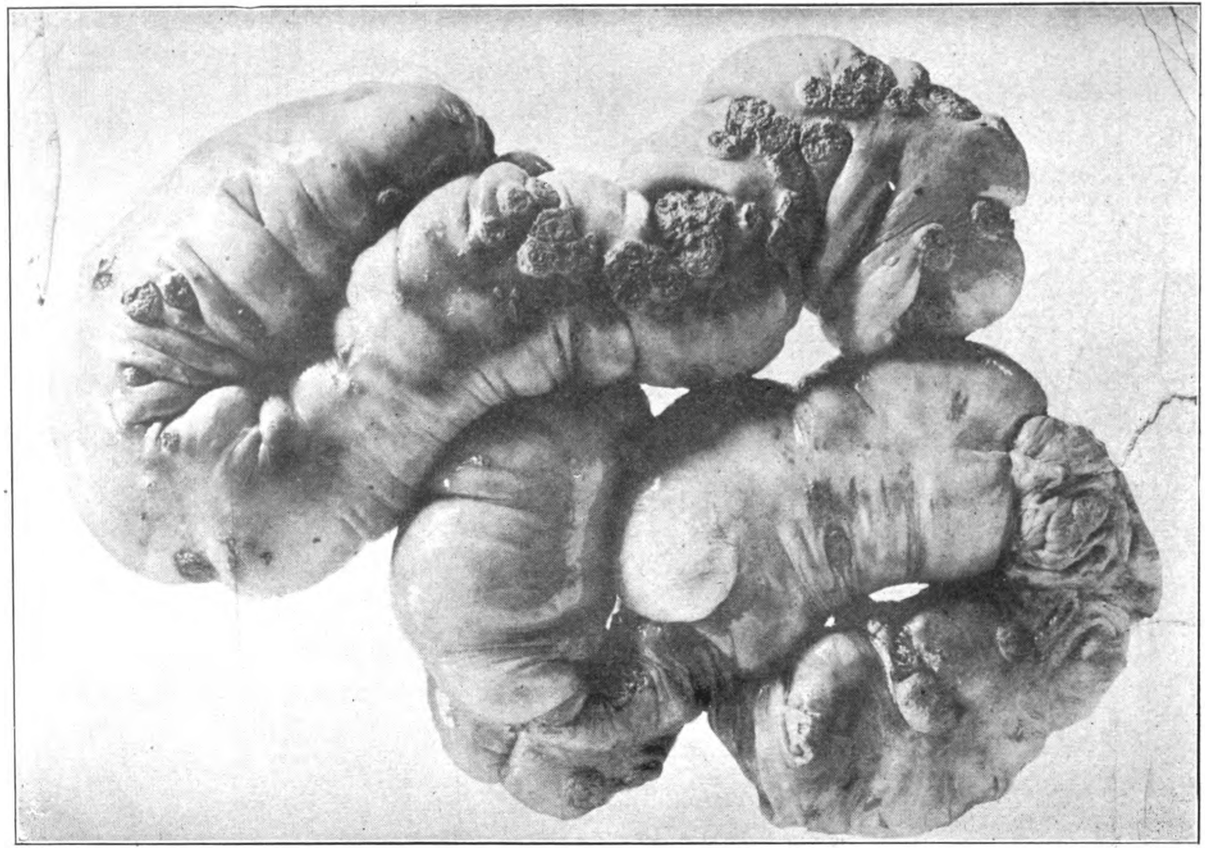
The dose of serum recommended is as follows, the amounts being given in cubic centimeters:

Under 50 pounds	15 c.c.
Under 75 pounds	20 c.c.
Under 100 pounds	25 c.c.
Under 125 pounds	30 c.c.
Under 160 pounds	35 c.c.
Under 200 pounds	40 c.c.
Under 250 pounds	45 c.c.
Under 300 pounds	50 c.c.
Under 350 pounds	55 c.c.
Under 400 pounds	60 c.c.

As stated, the serum-alone method is used in herds where the disease already exists, and is used preferably on seemingly healthy hogs. The



An easy way to vaccinate a light hog.

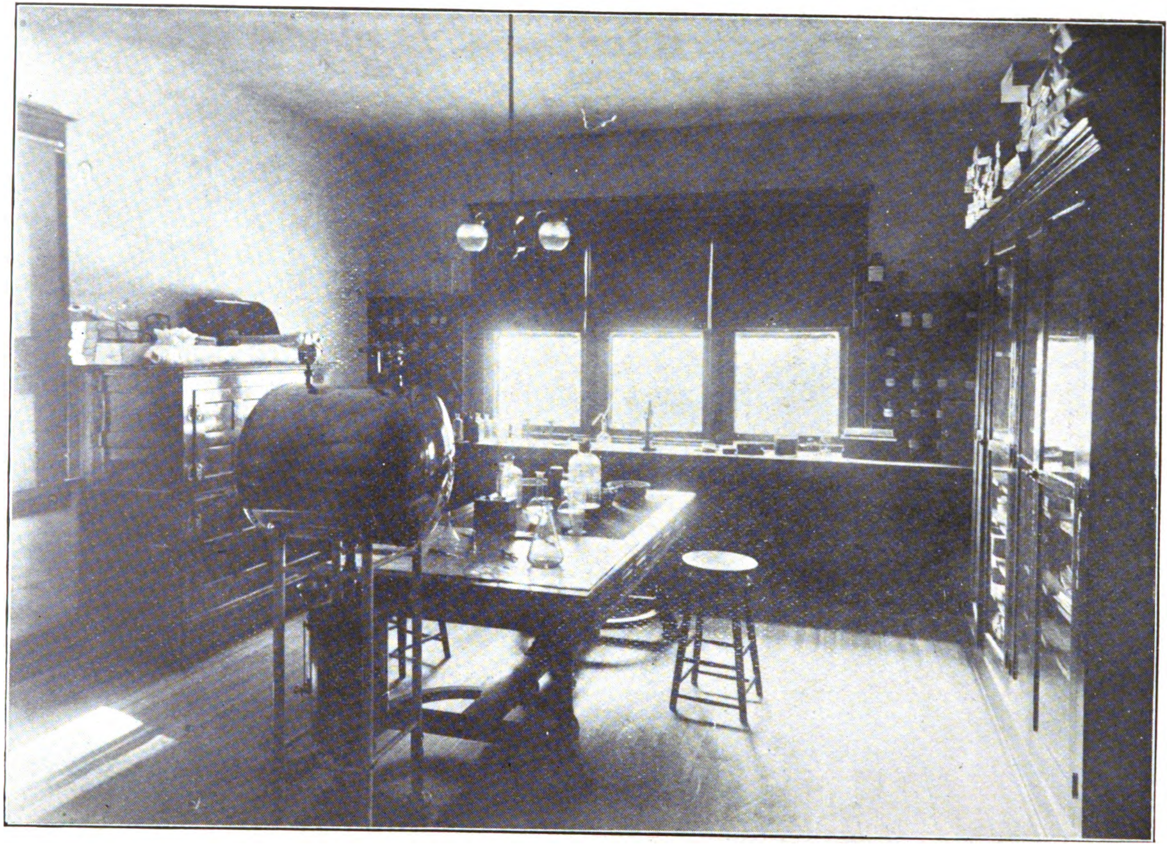


Ulcerated bowel of pig. Hog cholera.

earlier in the outbreak that it is used, the greater the number of animals that may be saved. Pigs that are very sick will probably not be benefited to any great extent. There is no danger in the use of the serum-alone method, and we highly recommend it where hog cholera exists, and where immunity is desired for only a short time.

The serum-simultaneous method consists in injecting the pig with hog cholera serum, and with hog cholera virus (diseased blood). The injections are made simultaneously, or, in other words, at the same time before the pig is released. The injections are made with two different hypodermic syringes, one containing the serum, and the other containing the diseased blood. Before the injections are made the skin should be thoroughly washed with a 2½ per cent solution of carbolic acid. The serum is injected into one thigh, while the diseased blood is injected into the other thigh. A hog weighing from 30 to 50 pounds receives 20 cc. of serum and 2cc. of diseased blood. This method is used only in herds where the disease does not exist. Pigs treated by this method should be immune for eight months to a year, or perhaps for a much longer time. As a rule, the method is not dangerous, but it is attended with more danger than the serum-alone method. However, the serum-alone method produces a shorter period of immunity and the pigs treated with the serum-simultaneous method are more immune against the disease. Therefore it is better to use the serum-simultaneous method, if the disease does not already exist in the herd.

Parties who are particularly interested in hog cholera or any other hog diseases, should correspond with the Illinois State Board of Live Stock Commissioners, at Springfield, Ill.



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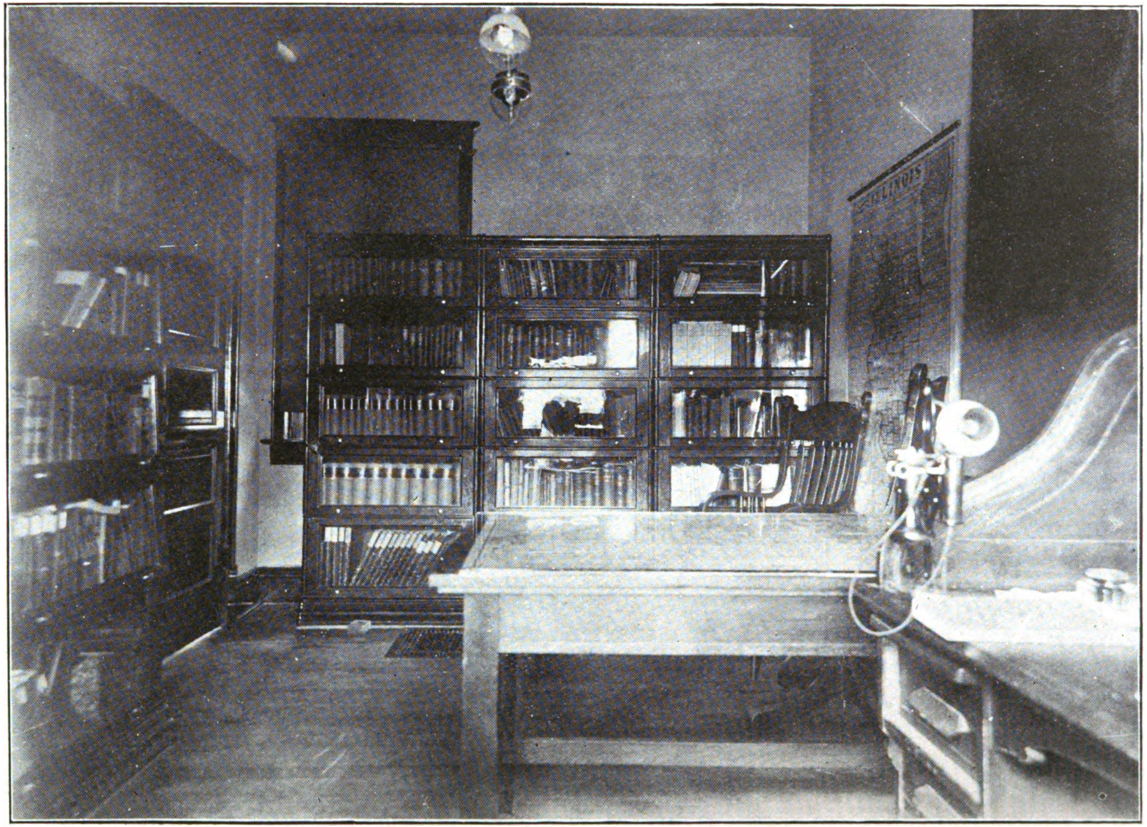

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BULLETIN No. 2, NOVEMBER 1910

Diseases of the Hog

By A. T. PETERS

STATE HOUSE
SPRINGFIELD, ILLINOIS

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INFECTIOUS SORE MOUTH IN PIGS.

A disease usually affecting small pigs, in which the lower or upper jaw and the snout become affected. It commences with a small sore on either of these parts, which rapidly spreads, and in a very short time involves the entire mouth, gums and tongue. This disease has been described by many writers as being caused by black teeth or due to the tusks that are seen on the sides of the jaws. Many writers claim that it is due to an injury caused by animals fighting or biting each other; but the latest theory advanced is that it is due to a lack of phosphate of lime in the bone. The bones of the jaw, being in need of these ingredients, become brittle, and the least injury will produce aggravating ulcers. It is essential, therefore, for the prevention of this disease that the sow should be fed enough lime ingredients so that when the small pigs are born the milk will contain a sufficient amount of lime ingredients.

Möhler, in bulletin No. 67, B. A. I., considers this disease due to the bacillus necrophorus. He says:

"As to the infection of a single calf or pig or the initial infection of a herd, it is evident that, inasmuch as the bacillus necrophorus is a normal inhabitant of the intestine of healthy hogs and presumably of cattle, the manure may be looked upon as the chief agent in transmission. Hence a most common method of infection in the calf or pig, when the gums are abraded or torn in connection with the eruption of the teeth, is suckling the cow or sow when the teats are filthy with manure. Again, the animal munching a little hay or straw which has been contaminated with manure may receive a stab at some point of the mucous membrane of the mouth by which the necrosis bacillus is introduced into the tissues.

"The transfer of the disease from one animal to another occurs time after time when newly born animals are placed successively in a pen previously occupied by an animal that had contracted the disease. In this connection it must be remarked that the question is not alone that of the transmission of the disease of necrotic stomatitis, but of the transfer from one animal to another of the infective agent.

"Necrotic stomatitis attacks principally sucklings not over six weeks of age, but calves and pigs eight to ten months old are frequently affected, and several cases of adult cattle showing the disease have been reported.

"Ordinarily, animals affected with necrotic stomatitis show no tendency to spontaneous cure. Left to themselves, they either die or become permanently stunted in growth. On the contrary, if taken in hand early, the disease is readily amenable to treatment. In the latter event the prospects of recovery are excellent, and under favorable conditions it takes place, as a rule, in twelve to fifteen days."

TREATMENT.

The affected parts should be well washed, once or twice a day, if possible, with a 5 per cent solution of permanganate of potash or carbolic acid, and, after being thoroughly cleansed, carbolic salve should be applied once or twice a day.

"If the predisposed animals are sucking, it would also be advisable to bathe the udder and teats of the cows or sows with a 5 per cent solution of carbolic acid in order to prevent infection from the probably contaminated manure on these parts. In animals that have been weaned it will be necessary to feed soft, nutritious food, such as whole milk, bran mashes, ground feed, and gruels, and to keep clean, cool water constantly within reach." A small amount of slacked lime should be given in the drinking water or milk. With these remedies the greater number of animals affected can be cured.

SNIFFLES.

This disease has been recognized in small pigs for many years. It is similar to that of sore mouth in pigs, only that there is a catarrhal form which causes more or less wheezing and a profuse watery discharge from the nostrils. This causes the animal to cough violently when it is aroused from its bed or immediately after eating, and on account of the difficult respiration the animal does not exercise freely. Usually the attack is of a mild character at first, then becoming more and more severe. As the disease progresses the discharge becomes thicker and is streaked with blood, and is of a yellowish color and of a quite offensive odor. Bleeding of the nose is frequent, on account of the animal making an effort to clear the nose. There is also a difficulty in swallowing and there seems to be a soreness of the throat. This trouble usually lasts from three to four weeks, the animal finally dying from starvation or asphyxiation. Should perchance an animal recover, it will be called a runt, on account of its growth being stunted. In the early stages the changes principally take place in the nose and in the bones in other parts of the body, the legs becoming affected more often than any other part. This disease is considered by many to be of a contagious nature, but observations and experiments lead the writer to believe that this is not true. It almost always affects the pigs belonging to one litter. Very seldom are other animals affected. It has often been noticed that pigs from certain sows nearly always have this trouble. On this account breeders have said that it is hereditary. This does not hold true. We have found, upon examination of the litters affected, that there was a deficiency of earthy salts in their food. Sniffles is sometimes caused by ill health, but it is more often brought about by feeding pigs such foods as are deficient in lime salts. Whenever pigs are fed food deficient in lime salt, it will cause a softening of the bone. Experiments have proven that where pigs are fed a deficiency of lime salts this trouble is very liable to occurr, while animals fed on food rich in lime salts will remain perfectly healthy. Therefore, it is well to remove the cause by feeding a properly balanced ration.

TREATMENT.

As stated, those animals that do recover are usually small and of inferior growth, and on this account one should consider whether it will pay to treat them, if only a few are affected. If wounds appear they should be washed at least once a day with a good disinfectant solution, and then carbolized salve applied. The sows should be fed liberal quantities of slacked lime, charcoal, and salt, mixed; and, if it can be procured, lime water should be given to the sows and affected pigs in their drinking water, at least a quart per day, according to the size of the animal. But, as stated, this disease can be largely prevented by using proper food, and therefore every effort should be put forth to prevent it, for it is difficult to perfect a cure.

BLACK TEETH.

Many articles have been written on this subject. Most breeders consider black teeth dangerous to hogs. What causes their presence is not definitely explained. The stockmen, however, connect black teeth with various diseases of the hog, especially those of sore mouth and sniffles, but a great many hogs that were in perfect health were found by inspectors at slaughter houses to be affected with black teeth. The writer does not believe that the presence of these teeth produces any disease in the hog. Of course, if they should be very long and sharp they may cause inconvenience in mastication, but it is not probable. The writer is inclined to believe that these black teeth cause more worry than actual trouble.

LARYNGITIS.

This disease is similar to that of quinsy, except that the larynx and pharynx seem to be affected and the trouble more severe. The symptoms are very much the same as those in quinsy, and the treatment should be the same. Care should be taken that the animals have clean, dry pens which are free from drafts. The animals should be kept free from dusty corrals and dusty pens, for the inhalation of this dust causes severe coughing, due to the irritation of the mucous membranes of the throat.

QUINSY.

This is a disease of the upper air passages. It is a swelling of the glands of the neck, and is therefore called quinsy. When the swelling is very extended it presses against the larynx, which is the upper part of the windpipe, and naturally this produces a difficult and noisy breathing and much distress. The swelling may become so extended that the animal dies from suffocation. The animal suffers from a sore throat. Usually there is not much coughing, but when a cough is present it is dry and hoarse. As stated, the breathing is rough, laborious and noisy. There is great difficulty in swallowing food or water, accompanied with high fever. The disease usually develops very rapidly and the entire air passages may close in a few hours, or in the course of several weeks recovery may be made. However, usually the animal either dies or recovers within four days.

Treatment.

Camphorated liniment applied to the neck seems to give some relief. When much congestion is present a salve made up of fifty parts of vaseline and ten parts of ichthyol has given very good results. In the drinking water potassium chlorate should be given at least three times a day: from ten to twenty grains may be given at a dose, according to the size of the animal affected.

PNEUMONIA (IN HOGS).

Pneumonia is an inflammation of the lung substance. We have three forms of this disease: (1) That involving the lobes of the lung, (2) that of the lobules of the lung, and (3) that of the connective tissue of the lungs. We find these stages in the hog to be practically the same as in cattle, horses and other domestic animals. We find that the symptoms are about the same. The hogs show a chill, and hide under corncribs, haystacks and the like. This is usually followed by what is known as the hot stage, during which there is an increased and labored breathing and a dry cough. The animal becomes easily exhausted and, after fever continues for a few days, they rapidly lose in flesh, become hollow in the flanks and prostrated.

The causes of pneumonia are many. Climatic conditions play the most important part. During the early spring, when hogs are not properly housed, it is not uncommon for them to die from this trouble. It is usually brought on when they are allowed to lie around haystacks, where they will pile up, become heated, and then are severely chilled, or it results from their being allowed to be out in a cold, drizzly rain.

Treatment.

The treatment for pneumonia should in the first place be prevention by removing the cause, which may be due to one or more of the conditions above mentioned. If treatment is necessary, first it is well to bleed the animal. This can be done by selecting the inside of the ear or tail or by opening the brachial vein of the foreleg with a sharp knife and extracting therefrom one-half a pint to a pint of blood. To facilitate the operation, a strong cord should be tightly tied around the limb just above the knee. The blood will be seen to rise in the vein and can then be easily extracted. A mild laxative is indicated, giving about a teaspoonful to a tablespoonful, according to the size of the animal, of flaxseed, cotton or linseed oil, or a small dose of castor oil. Tartar emetic may be given in one-fourth to one-half grain doses, according to the size of the animal. An old remedy consists of giving the pigs small doses of tar every morning. The animals should be kept in dry, well ventilated quarters and care should be taken that they are not subject to drafts. They can receive plenty of fresh air.

Mechanical pneumonia is caused by compelling animals to inhabit quarters where they are obliged to continually inhale a great quantity of dust. This dust naturally adheres to the mucous membranes of the breathing organs, such as the bronchial tubes, and when these are completely filled up mechanical pneumonia is the result. This disease alone takes away many thousands of hogs annually. In many instances, during a very dry spell, the hog lot becomes very dusty, so that the hogs moving around in the corral stir up a cloud of dust; and it is this dust that causes these heavy losses.

Mechanical Pneumonia Produced by Parasites.

The symptoms in this case are almost the same. The animal coughs at the least provocation, loses flesh rapidly, and becomes greatly emaciated. It is caused by very small threadworms lodging in the bronchial tubes, and these threadworms, if not removed, will finally obstruct the air passages completely, causing heavy losses.

VERMINOUS BRONCHITIS (LUNG WORMS).

Verminous bronchitis, or verminous broncho-pneumonia, the most serious parasitic disease of the pig, is caused by the strongylus-paradoxus. This parasite matures in the bronchi and distended air vesicles of the lungs, where it lays eggs or brings forth its embryos. It differs from most of the other parasites because some of its eggs are hatched before being deposited by the females and others are not. The eggs and embryo may develop in the bronchi or they may be expelled by coughing and develop in pools of water or wet places. The disease is usually spread by the larva being ingested with the food or water.

It has not been demonstrated just how the young worms that are taken with the food and water may reach the lungs, but it is probable that some stick to the walls of the throat and then pass from there down the trachea (windpipe) to the lungs. Nor has it been determined how long their eggs may live when dry; but Friedberger and Froehner state that Bauer has recorded an outbreak of the disease in a wet season where it had not been observed for eight years previous, which happened to be dry ones. While this does not demonstrate the fact, it would indicate that the dry eggs had lived for eight years.

The worms, when present in quantities, twist themselves together in bunches in the bronchi and produce an irritation that results in the secretion of a thick viscid (sticky) mucus, which, with the masses of worms, interferes more or less with the functions of that part of the lung, and, if extensive, results in a broncho-pneumonia that is frequently fatal, especially in young pigs. The symptoms are a cough with the discharge of a thick mucus, containing worms and eggs, and it may be streaked with blood; rapid loss of flesh, weakness, and loss of appetite as the disease advances. The disease may run a rapid course, especially in young, poorly cared for pigs, but in strong, thrifty, well cared for animals it is more apt to assume a chronic form. It is most frequently seen in the spring and fall, and especially in wet seasons, which would indicate that pigs, especially young ones, should be kept in dry quarters.

Lung Worms (*Strongylus paradoxus*).

It is very difficult to destroy these worms because of their collecting in such masses, and the thick, viscid mucus that surrounds them protects them from coming in contact with medicine.

TREATMENT.

The treatment consists of two kinds: preventive, or prophylactic, and curative.

Preventive treatment consists in keeping the parasites from susceptible animals, while curative treatment consists in ridding the host of parasites that may be infesting it at the time. Any system of preventive treatment should take into account the life history of the parasite, its method of dissemination, and the manner in which it may come in contact with, or gain an entrance to, the system of the host. For illustration, dry pastures, clean, dry feed lots, and pure food and water will greatly reduce the chances of, if they do not actually prevent, infection by such parasites as require moist places or water in which to perfect their development.

Curative treatment consists in giving remedies that will destroy or cause the removal of the parasites. The following coal-tar creosote solution is the most efficient:

Coal-tar creosote ....1 ounce.
Water ....99 ounces (6 pints and 3 ounces).

One ounce of this is a dose for a full grown animal and is best administered with the morning feed. Or you may give them turpentine or gasoline, which should be administered in the swill, and best on an empty stomach. The best way to feed this medicine is to omit the morning feed and give a tablespoonful in the feed for an average hog. Two or three applications usually suffice. If you wish to drench the animal, instead of giving it in the feed, use a drenching tube. A drenching tube may be made by taking an ordinary tin funnel and rubber tube or hose, say 3 feet long and 3/8 to 1/2 inch in diameter. Into this rubber tube insert the lower end of the funnel, and then drench the animal by placing the rubber tube between the animal's back teeth, allowing the hog to bite on it. It is also well to place a piece of metal at the end of the rubber tubing, so that the animal may bite on it continually without stopping the flow of fluid by pinching the rubber hose. It is of great importance not to close the patient's nostrils while drenching.

CHRONIC COUGH.

This disease manifests itself in the respiratory organs of small pigs and shoats. The animal usually coughs, especially during feeding time and whenever it becomes excited. In a preceding chapter it is stated that this trouble is often occasioned by too much dust. This is the cause in the majority of cases. Another cause is improper feeding. Excessive amounts of corn, regardless of a proper balancing of the ration, will produce a softness of the cartilage of the nose, and, as a result, small tumors (polypi) are formed, which cause labored breathing and also a cough. This cough occurs in pneumonia, mechanical pneumonia, and verminous bronchitis, and has been described in the chapters on these diseases. It is always good policy to make a thorough investigation to ascertain if it is due to either one of these diseases.

TREATMENT.

Naturally the first treatment should be in the direction of a preventive. Too much cannot be said against dusty pens. Hogs will thrive very much better when they are kept in quarters as free from dust as can be secured. One should ascertain how the animal has been fed, and if too much corn has been given this should be remedied immediately, and liberal amounts of charcoal, bone meal, or ground bone should be added to the feed. For treatment it is well to use petroleum or kerosene. Give a teaspoonful or a tablespoonful, according to the size of the animal, once every other day in the feed or drinking water. Animals that cough do not, as a rule, thrive well, and therefore are not profitable, so it is of importance to make an effort to allay this trouble.

APOPLEXY (THUMPS).

This disease is seen mostly in young pigs, but it may also occur in older animals. The nature of this disease has not been fully determined. It is considered by some as a nervous disease and by others as a heart disease. It is believed to be brought about by a lack of exercise and by bad food.

Symptoms.

The pig is found standing jerking his body forward and backward every few minutes. This is very noticeable and may be very violent. Sometimes a sound accompanies the jerking movement, which can be heard at some distance. Upon examining an affected animal the writer has never been able to ascertain what produced this peculiar sound. He is inclined to believe that it is due to a spasm or cramp of the diaphragm. It is more often found in pigs with full stomachs that are in excellent condition and have very little exercise. It is also seen more often in litters of pigs that are farrowed at a time when they cannot be given the necessary exercise. It is not found so often when the pigs are on pasture. Possibly the full stomach pressing against the diaphragm causes this trouble. If the disease is not controlled in the early stages the result is usually fatal.

Treatment.

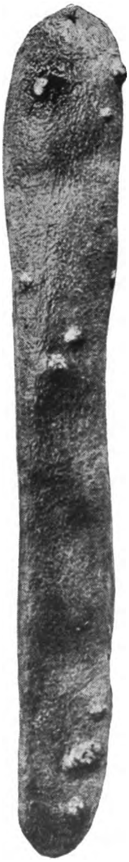
The treatment for this disease is as follows: Tie a string around the front limb so as to raise the vein plainly, then puncture it with a knife, and draw about a cupful of blood. This seems to relieve the blood pressure from the brain and the animal seems much relieved. In addition to this, give from ten to fifteen drops of tincture of Cannabis Indica, which can be given with a little syringe on the tongue. This dose may be repeated within three hours. It is well to give a laxative in the form of one ounce of castor oil or two ounces of sweet oil, which may be given in the swill, or two ounces of Epsom salts. If you wish to give the oil as a drench, instead of giving it in the feed, use a drenching tube. A drenching tube may be made by taking an ordinary tin funnel and a rubber tube or hose, say 3 feet long and 3/8 to 1/2 inch in diameter. Into this rubber tube insert the lower end of the funnel, and then drench the animal by placing the rubber tube between the animal's back teeth, allowing the pig to bite on it. It is also well to place a piece of metal at the end of the rubber tubing, so that the animal may bite on it continually without stopping the flow of the fluid by pinching the rubber hose. It is of great importance not to close the patient's nostrils while drenching. For an after-treatment it is well to give a teaspoonful of ground or whole flaxseed for at least a week, and give the animals plenty of exercise.

TUBERCULOSIS.

Hogs become infected mostly through the feed, seldom through the lungs. Hogs that are kept in dairies are more often found tuberculous. It is not uncommon to find whole herds of swine in dairy districts suffering from tuberculosis, so that the hog buyer uses great caution in buying hogs from those districts. Tuberculosis in swine is rapidly increasing. Young pigs are more liable to tuberculosis than older ones. It can safely be said that in nine cases out of ten infection is produced by ingestion. Pigs that are fed the refuse skim-milk from the dairy or the viscera from cattle that have died from tuberculosis very readily contract this disease.

Symptoms.

During life the symptoms of tuberculosis in swine are much less marked than those in cattle. As a rule, the general health of the animal is not much altered or impaired. In most cases tuberculosis of pigs is



Tuberculous Spleen of Hog.

first noticed in the packing house. Sometimes there is a local disturbance, such as the swelling of the joints, especially of the shoulder and knee, which causes lameness and arching of the back, and a swelling of the lymphatic glands of the neck. These are all marked symptoms of tuberculosis. There may be a localization in the abdominal organs. This usually causes emaciation and unthriftiness. Tuberculosis may affect any organ or tissue of the body. Some of the marked symptoms, however, are a loss of flesh and a general unthriftiness. The animal has very little spirit, seems very drowsy all the time. Still, the animal may eat well, but it seems that the nourishment does not assimilate properly, due to the disturbance in the organs of nutrition. Whenever the glands of the neck and lungs become affected, then usually a hacking cough is noticed, with difficult breathing. In nearly all cases the lymphatic glands of the neck are very much enlarged. This can be very readily seen and felt. One must consider this as one of the important symptoms. Next the enlargement of the joints already mentioned, and the peculiar gait of the animal. The animals grow weak rapidly. In the latter end of the disease they lie most of the time. When finally death occurs they are very thin. When tuberculosis develops in the bowels we usually find first the animal is severelv constipated, later on changing to diarrhea. During this time the animal becomes very much thinner and weaker and finally either is destroyed or dies. It is of importance that breeders should not breed a sow that is not doing well or shows symptoms of tuberculosis, for her little pigs will become infected very early, and it is safe to say that not one of them will live to be a mature animal.

On post-mortem examination one finds tubercular nodules in the lymphatic glands, especially those of the neck. Tuberculosis of the liver is found in about 50 per cent of the animals that die from this disease; the next organ is the spleen, being affected in about one-third of the cases; the lungs being affected in about one-tenth. It is interesting to notice that in most tuberculosis hogs the bones are affected. When the lungs are affected they very often adhere to the ribs and are pulled apart with great difficulty. The lungs do not collapse and feel gritty and rough as though they were filled with shot. Whenever tuberculosis is suspected in a herd it is well to open up an animal and hold an examination, and if the organs are found to be affected as described, then the carcass should be burnt and not fed to the other hogs, so as to prevent further infection.

PREVENTION.

Where hogs are affected with tuberculosis they should be carefully examined. All animals that show in the least the symptoms described should, if they are in fair flesh, be sent to the packing house subject to inspection. If they are not fit for the packing house they should be slaughtered and then burnt. The premises should be thoroughly disinfected with a good disinfecting solution. It is important that not any of the tuberculous animals remain on the premises, for if they do they will surely infect the other animals and the same process would have to be gone through with again. For this reason tuberculosis in swine is as dangerous as hog cholera, if not more so, for if proper disinfection and prevention are not instituted, this disease will stay on the premises for many years and will continually cause losses. The disease can be prevented but cannot be cured. We cannot use the same method that we use in testing cattle for tuberculosis, that of subjecting them to the tuberculin test, for it is not adaptable to hogs. It has been tried but not successfully, therefore the only remedy is the cleaning up of the entire herd and thorough disinfection of the whole premises. As to treatment, there is none. No cure has ever been found for tuberculosis in the human being, in cattle, nor in hogs, therefore one must rely entirely upon preventive measures.

GASTRO-ENTERITIS.

Inflammation of the stomach is very hard to distinguish from inflammation of the intestines. The causes of this disease are many. Improper food or insufficient food or foreign bodies, such as pieces of bone or glass, and spoiled food, such as rotten corn, and highly fermented food, green corn, and irritants, such as sand, hotel swill highly charged with washing powder or lye—all these are capable of producing inflammation of the stomach and intestines.

The symptoms are usually loss of appetite, vomiting, grinding of teeth, unrest, stamping of feet, formation of froth around the mouth, bad breath, increased redness of the gums, uneasiness, lying down and getting up soon after, a high fever, rapid breathing, a very dry skin, and great thirst. When vomiting, contents may be streaked with blood. As the disease progresses the animal becomes dull and much emaciated, and prostration becomes more noticeable. In severe cases nervous symptoms are also developed by the animal, together with frothing at the mouth and partial paralysis.

On post-mortem examination we find that the mucous membranes are swollen and highly congested, and that the membranes of the intestinal tract are of a dark color. The lymphatic glands are red, inflamed and thickened. We may also find ulcers.

TREATMENT.

When treatment is used it should be of such a nature as not to cause too strong an irritation on the mucous membranes of the stomach and intestines, therefore we have no better remedy than raw linseed oil or castor oil. This may be given as an emulsion with some milk or gruel, giving about four ounces to five ounces of the oil at a dose. Salts, such as Glauber's and Rochelle salts, may be given in two or three tablespoonful doses. They are more active but are more irritating. There is nothing so good for a mild purgative as the oil; next to that the flaxseed given in tablespoonful doses is very good. Where the animal shows considerable pain, it is well to give a small amount of opium; two grains of powdered opium may be used. Where there is considerable irritation of the mucous membranes of the intestines, it is well to give an injection consisting of soapsuds. This can be done very easily by placing the animal in a crate.

INFLAMMATION OF THE INTESTINES.

As stated in the preceding chapter, it is difficult to distinguish between inflammation of the stomach and inflammation of the intestines. The symptoms of the latter are nearly identical with those of inflammation of the stomach. The causes are also similar. Most hogs show upon post-mortem examination that both the stomach and intestines are affected, and the same treatment can be used.

DIARRHEA, OR SCOURS.

The pigs most afflicted with this disease are those which are sucking or those which have lately been weaned. Some breeders attribute the cause to an insufficient supply or to the poor quality of the milk given by the sow. Irregular feeding, cold and damp pens, also sudden variation in temperature, and very often green food given to sows with litters may bring on an attack. When scours occur within a few days after birth, it is thought that it is brought on by the feverish condition of the sow. The writer is inclined to believe that this is not true, but that it is due to the poor milk of the sow, and that if the food is properly corrected it will soon be checked. The writer has found that where scours occur the milk is very much deficient in its natural properties and that these sows lack earthy salts in their feed. When sows are fed liberal amounts of charcoal, lime, and the like, their litters very seldom are affected with this trouble. The writer believes that the other causes mentioned must be considered, but that it is largely produced by the feed. In pigs that are weaned and fed large amounts of separator milk, especially when the separator milk is allowed to ferment in the sun, this trouble is very common. Where separator milk is fed judiciously to hogs, it is one of the best feeds that can be given them.

The symptoms are as follows: The excrement is very loose, becoming more and more watery and of a whitish color. In small pigs it is more of a slate color and adheres to the limbs and especially to the tail. In the early stages the appetite is good, but the pig soon becomes very much weakened and exhausted and with it then the loss of appetite. The flanks become hollow, the hair rough, and in this stage we may have severe straining and vomiting and also fever. This disease is very often mistaken for hog cholera. On account of this disease being one that is largely due to bad hygienic conditions, it can therefore be very easily prevented by bettering the conditions. If it should be found to be due to bad food or a poorly balanced ration, this can very easily be remedied. The affected animals should be kept in a separate place and treated.

Those that are not affected should be removed from the sick ones. It has been said that the feverish conditions of the sow would produce this trouble; therefore, sows should be dieted several weeks before farrowing. Every sow should receive extra care a few weeks before farrowing. It is not well to administer purgatives to sows at that time, but the writer has found that some flaxseed, a teaspoonful given once a day for three days and then omitted three days, gives very good results by loosening up the bowels and thereby preventing a number of other disorders in the hog. Charcoal and salt, cob ashes, and wood ashes should be accessible all the year 'round. This largely supplies the earthy salts that are necessary. A few days after the pigs are farrowed the feed should be light. Care should be taken to keep the sows in nice, dry pens, so that they and the little pigs will not become chilled. It is always well to start pigs on green food sparingly, using quite a lot of dry food with it. Pigs should always receive pure water. When an attack of diarrhea sets in, it is well to make up a 1 per cent solution of permanganate of potash and and allow them to drink that. This will aid in the disinfection of the intestinal tract. As a feed for the little pigs we can give such things as parched flour; for grown hogs laudinum may be given in the feed, and for sucking pigs a few drops on the tongue. When slop is fed, a 1 per cent solution of permanganate of potash should be added to the swill.

CONSTIPATION.

This consists of a dryness and a hardness and an undue retention of the faeces. In pigs this is an indication that a change of diet is necessary. It is very often found in sows soon after parturition and in young pigs which are very highly fed. It is also caused by too much dry feed with a lack of water. It is also due to high fevers and paralysis of the intestines. Animals that are affected with constipation eat little but seem to drink a great deal. In ordinary cases this trouble is not hard to correct. In the summer time a little succulent green food usually suffices. When dry food is given, the addition of a small amount of oil meal or flaxseed meal usually corrects this trouble. When medication is necessary the writer prefers either a linseed tea or raw linseed oil to the salts, because they act with less irritation on the stomach and intestines than do the salts. When salts are given, not more than one ounce should be given at a time. It is also well to irrigate the intestinal tract with soapsuds.

STRICTURE OF THE RECTUM.

This is a common occurrence in pigs. The symptoms are great straining and a difficulty in defecation, caused by the stricture of the lower bowel or rectum. This may be caused by a thickening of the walls of the intestines, or it may be caused by irritation due to chronic constipation brought on by eating too much food, or it mav be the result of a severe attack of diarrhea. This stricture is usually discovered in animals in its advanced stage.

The symptoms are those of severe straining and the passing of a semifluid, the animal showing considerable distress and very often signs of abdominal pain, such as colic. When the symptoms of constipation are present, an examination should immediately be made. In most cases it is difficult to save the animal, and it should be destroyed to relieve it of misery.

TREATMENT.

If treatment can be given, the first step that should be taken is to dilate the bowels and then the parts may be rubbed with tincture of iodine or an opium ointment. If the tumor is of the nature of a hard growth, it must be removed with a knife or by a ligature. This is always a dangerous operation and must be performed by some one that is familiar with the anatomy and accustomed to the operation. Furthermore, it is dangerous to operate on hogs, for the reason that they almost always have a weak heart and usually die after the operation, from the shock. For a spasmodic stricture, tincture of opium or laudinum or a solution of cocaine applied to the parts is very beneficial. This should be applied to the inside of the rectum at least once or twice a day. In addition to this, laxative food should be given.

PILES.

This is a soft tumor and usually bleeds very easily. These tumors are found about the anus. There is another kind of tumor which does not bleed. Some of these tumors are also situated internally in the rectum, while others are situated externally. Usually the tumor that bleeds is of the external character. These tumors are filled with a liquid blood. The harder ones contain coagulated blood. There is always more or less inflammation present. These tumors cause the animals a great deal of pain and annoyance, and they fret considerably, and lose rapidly in flesh, or at least do not make any gain. These tumors are caused very often by giving animals too much dry food. In a severe attack of diarrhea, the straining often causes a protrusion of part of the rectum, and as a result of the severe irritation these tumors are formed.

TREATMENT.

For treatment give a mild laxative, such as feeding a tablespoonful of flaxseed once a day or an ounce to an ounce and a half of linseed oil once a day. When this laxative operates it usually relieves this irritation and inflammation. If the tumor is very large it may be removed by ligating. If not, it may be dressed and the following mixture may be applied: vaseline 50 parts and ichthyol 5 parts. Rub this salve into the bowel and on the tumor once a day. If constipation is present an injection of soapsuds should be given. It is, of course, important that animals should be fed laxative food while in this condition.

PROLAPSUS ANI.

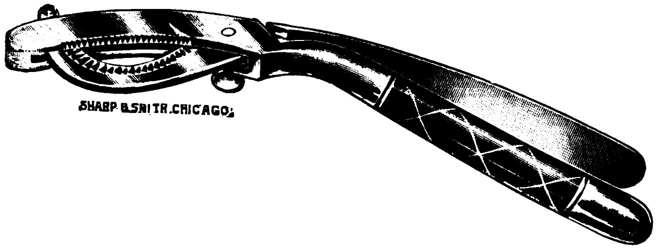
This is one of the troubles that we find very frequently among pigs. It is not uncommon to have this occur after an animal has had an attack of diarrhea or severe constipation. It is usually the mucous membranes of the bowel that protrude. They are highly congested and after they have protruded for a day or two they become a very dark color. As stated, it is usually due to some irritant to the bowel. However, it seems to yield very readily to treatment. The first thing that is necessary is to wash the affected parts with hot water and soap, cleansing them thoroughly. This bathing should be continued for twenty to thirty minutes, then the parts should be oiled with an ointment made up of vaseline 50 parts and ichthyol 5 parts. In some cases after the bowel has been carefully put back it may be necessary to take a stitch of linen thread across the opening to keep it from slipping out again. As stated in the two preceding chapters, it is important to feed laxative food while the animal is in this condition. If, however, the parts should become gangrenous, then they should be removed with the knife or ligated.

RUPTURE.

In castrating ruptured pigs, the animal is laid on the back with its rump elevated somewhat. It is sometimes necessary to hang them up by their hind feet. The bowels will then usually drop back into the abdominal cavity. An incision is made through the skin just where it would be made in an ordinary case, and with the fingers the connective tissue is torn away until the testicle, enclosed in the white coat of peritoneum, is exposed. In case of rupture, or scrotal hernia, a portion of the smaller bowels have slipped down through the inguinal ring along the cord and around the testicle. By taking hold of the testicle with its envelope, the bowels can now be pressed downwards through the ring, if they have not already dropped back. A strong linen string is now tied around the spermatic cord as close to the body as possible and the cord severed with a knife about half an inch outward from the tie. Great care should be taken to have the bowel pushed entirely back so that no part of it is caught in the tie. To be certain of this it is well, after the cord is tied, to split the envelope from over the testicle down to the tie before severing the cord. This operation is no more dangerous than the ordinary operation of castration, and is the same in both pigs and colts.

CASTRATION.

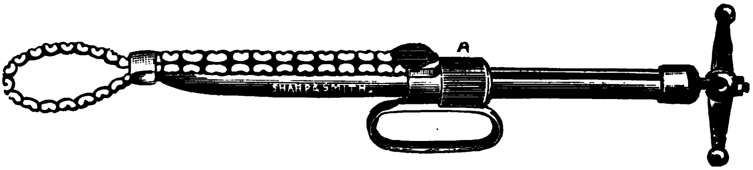
Pigs may be castrated at any time. Of course, it is advisable to avoid extreme cold weather or unfavorable weather and extremely hot weather. It is not so advisable to castrate during extremely hot weather, for the flies are a nuisance, especially the blow-fly, and may infect the wound so that it may be dangerous to the life of the animal. As to the age of the animal, castration may be performed on animals of all ages if the operator is careful. Of course, there is a great difference of opinion among breeders as to what time it is preferable to castrate pigs. However, the writer believes it is preferable to operate shortly after they have been weaned. When pigs are older the operation is more easily performed than on younger animals. It is always well to prepare the pigs for this operation by feeding them light the evening before and giving them no morning feed prior to the operation. This will prevent a great deal of the after effects, such as vomiting, which is caused by the animal having a full stomach and the food pressing against the diaphragm, causing nauseation, which is dangerous from the fact that the food may lodge in the windpipe and there cause lung trouble. After the operation has been performed the animal should be fed lightly for a day or two. If green pasture is available they should be turned out on green food. When laxative food is fed it prevents a feverish condition and also constipation. If the animal is prevented from wallowing in dirty places until the wound has entirely healed, it will be of great benefit in preventing infection and the lodging of mud in the wound, and thus will allow it to heal up much more readily.



Emasculator.

The operation is performed by catching the pig and laying it on its side with the head a little lower than the hips. It is well to have at least two men hold the animal. The scrotum should be cleaned with a strong solution of either kreso, carbolic acid, or any other of the good disinfectants. In castrating pigs of considerable size it is well to make two long incisions into the scrotum, one on each side of the central rapha, or seam, and after the testicles have been removed take out the strip between the two cuts. The old idea that the animal will surely die if the seam is cut across has been proven false. By taking out this central strip or seam there is no danger of this closing and forming an abscess, as is so often seen when the incision is not made perfectly. To avoid these growths one should use the following precautions: The incision should be made low down, so as to give perfect drainage. The cord, when left too long, grows to the side of the scrotum. Dirt gets into the wound, producing a large tumor. On account of the number of blood vessels that supply this part, the tumor grows very rapidly. These growths are more easily prevented than cured. If one will take heed and make the incision low enough, the wound large enough, and take enough off of the cord so that it will not be too long, he will effectually prevent this occurrence. The operation in itself is not so dangerous, because the majority of these growths could be removed without very much blood, but on account of the fact that hogs cannot stand surgical operations very well, most of them die from shock after the operation has been successfully performed. If one wishes to operate on a growth of this kind, the entire surrounding parts must be washed with a 2 per cent solution of kreso or some other good disinfectant, and the entire tumor then carefully dissected out. It is usually not necessary to use a knife, but the tumor can be peeled out so that not many blood vessels will be severed, thereby reducing hemorrhage. After the thorough removal of the tumor the wound should be washed out with an antiseptic and the scrotum sewed up. If the precautions above mentioned are heeded this trouble will not occur.

DUNN'S IMPROVED ECRASEUR.



Chain Ecraseur.

WOUNDS.

The hog is subject to numerous wounds. We have to consider principally lacerated wounds and punctured wounds. Hogs that are kept for breeding purposes are usually allowed to follow the cattle in the feed lot, and it is on this account that they are very apt to receive injuries. Being in a lot with a number of cattle, they may be injured by the cattle stepping on them, causing injuries to the limbs and those of a lacerated character. The majority of these wounds yield readily to treatment if the dirt and foreign substance are removed and the wound kept clean. One of the other sources where the hog receives injuries is going through barbed wire fences. When swine plague or hog cholera is in the neighborhood it is important that the hogs be comparatively free from wounds. It is at that time not advisable even to mark the animals, as is customary, by slitting the ear, because it is through these wounds that hogs contract the disease. Another operation that should be deferred is castration. The writer has observed instances where swine plague and hog cholera were successfully guarded against until the operation of castration was performed while these diseases were in the neighborhood, and that the animals operated on were the first ones to come down. In hogs that are coming down with hog cholera, it is not uncommon to find one or more surface wounds caused by barbed wire. All wounds should be treated antiseptically, as nearly as this can be accomplished.

SORE TAIL.

This disease is more often seen in damp and in very soft, dirty feed lots. The tail becomes chapped and mud enters the wound, resulting finally in a breaking off of part of the tail. A number of breeders attribute it to indigestion, for it is found in animals that have a poor assimilating power and in hogs that are fed on large rations of swill, especially hotel swill.

TREATMENT.

The treatment consists of first removing the cause. It would be well to include also removing them to clean, dry quarters, allowing them to be in the sun as much as possible and treating the affected tail with any good disinfectant, such as may be on hand. The dirt and crust should be removed with the aid of lukewarm water and soap, and then vaseline, made up with either carbolic acid or one of the coal-tar dips, may be applied.

WARTS.

Warts may appear upon any part of the body. They are an abnormal growth, consisting of a thickening of the cuticle. They are very unsightly and when rubbed or bruised they may bleed and ulcerate. In some instances they are flat and spread out over considerable surface. The cause of warts is not very easily accounted for. Some writers attribute them to a highly concentrated food. Others claim that they are due to a derangement of the digestive organs which produces a disorder of the skin. Some species of warts seem to be highly contagious.

TREATMENT.

They very often disappear without any treatment. Allowing the hogs to run on good alfalfa or clover pasture often effects a cure. Warts can be clipped off with a pair of scissors, and if they should bleed they can be seared over with a hot iron to stop the hemorrhage. This is probably the best method to use. Arsenic ointment can also be used. Caustics are also employed, but the removal of warts with a knife or scissors seems to be the best form.

SORE FEET.

Sore feet in pigs is more often met with where the animals are kept on hard, slippery floors or when they slip in the lot on frosty days, injuring the sensitive parts of the feet. Sore feet are also brought about by foreign substances, such as cinders and splinters getting between the toes. What is known as "foul rot," such as seen in cattle and sheep, is not rare in this country. It is caused by damp, unsanitary feed lots and stables.

TREATMENT.

The treatments for these affections are as follows: The cause should first be removed. If the affection is due to slippery floors this should be attended to. If it is due to a foreign substance between the toes, this should be removed and the foot treated antiseptically as any ordinary wound. If it is due to something like thrush, the foot must be first thoroughly cleansed with lukewarm water and soap, and then the pine tar, to which some sulphur has been added, can be applied. It is also recommended that when the feet are very sensitive the animals should be placed on some soft ground, such as sand or soft, not muddy, dirt floors. The writer has not found it practical to poultice. If proud-flesh is present, then equal parts of powdered alum and carbonate of soda should be applied once a day, or any of the coal-tar dips can be applied full strength.

SPRAINS.

Sprains occur through slipping on hard floors or on icy ground. It is not uncommon to find that heavy boars or sows have received sprains, especially in the hip-joint or at the hock-joint. Sprains are also frequent along the joints of the fore limb.

TREATMENT.

The majority of these recover when given rest. Good liniment may be applied in the form of equal parts of cotton-seed oil and ammonia. This does not blister enough to take off the hair. The most essential feature of the treatment is to give the affected animals plenty of rest and make them comfortable.

RHEUMATISM.

Rheumatism is quite common among pigs. It is more often met with during the winter and spring, especially during damp, cold springs. Cold, damp floors seem to produce this disease. It is almost always found where hogs are not properly housed and exposed to the northeast winds, and where the buildings are damp and lack sunshine and where drafts are permitted to have full sway. During severe cold weather this disease is greatly aggravated, but the animal seems to improve very much when warm weather sets in. It is, however, occasionally found where the best hygienic conditions prevail. It cannot be entirely attributed to cold, for a great many animals exposed to the cold escape. Cold is, no doubt, one of the most potent accessories, but not necessarily the essential cause. There are other conditions, such as imperfect metabolic products, as an excess of lactic acid in the system. It is thought that this excess of lactic acid produces rhachitis in young animals. The excess of lactic acid is thought to be due to the overwork of the muscles of which it is the normal product. Another theory is that it is due to neurotic causes, such as a chill of the nervous system, which may affect diseased or overworked joints. Another theory is that of infection. This has been advanced by some able authorities and they believe that it is of an infectious nature from the fact that micro-organisms have been found in the articulation of joints of rheumatic patients, and they surmise that it is due to a specific microbe. But up to this date no specific microbe has been discovered and demonstrated by scientists. It is a fact that rheumatism affects most frequently joints that have been injured, for instance, an ankle that has been sprained or that has suffered a severe blow or that has been severely bruised and inflamed or injured from many other causes. It seems that these joints are particularly sensitive to rheumatic affection. Articular rheumatism seems to be an enlargement of the joint, which forms an inflammation of the synovial membranes and usually implicates all the constituent structures of the joint.

SYMPTOMS.

The symptoms are usually quite pronounced. The animal may be lame in one or more legs and the lameness may shift from one point to another. The swelling of the joints, such as the hock and knee, is usually very marked. They become very tender upon pressure. Whenever the leg is handled there is an intense pain accompanied by a squeal. Oftentimes one is inclined to believe that the limb has sustained a fracture, judging from the severeness of the pain. While the animals are lying down, apparently asleep, there is usually a sudden contraction, indicating severe pain. It is almost always accompanied by a slight fever and a loss of appetite. The animal does not exercise and it is difficult to have him take up nourishment.

TREATMENT.

The treatment of these cases should be largely that of prevention. The animal should be placed in dry, comfortable quarters, free from drafts or unnecessary exposure. Do not allow the animal to be housed in the cold during the night, especially do not have him make his quarters under a strawstack or haystack. Strawstacks may be credited with producing more of this disease than any other cause, for the animals will pile up and during that time become very warm, perspire, practically steaming, and when compelled to move about for their food the sudden exposure brings on this affection. As stated, the affected animals should be placed in nice, warm, comfortable pens where they can be kept quiet and induced to take up nourishment. Laxative food should be offered. Epsom salt may be given, or castor oil, calomel, or aloes; any one of these may be given as a purgative. The purgative should not be given while the animal is in a feverish condition. Lime water is very good and about a cupful should be given in every feed. The hog should also have access to sand, charcoal, and salt, and, when recovering, a small quantity of ground bone should be added to its daily ration.

RACHITIS (LACK OF DEVELOPMENT OF BONE).

This is a condition that is due to lack of development of bone. It is most frequently found in young animals and is associated with disorder of the processes of digestion, nutrition and assimilation. It is especially characterized by the softening and the distortion of the bones. Some breeders think it is more often seen during the growing of the pig after weaning. The greater number of cases are seen during the winter. This can be accounted for in this way, that the animals are penned up during the winter time and cannot root and come in contact with the earthly salts that Nature seems to say are necessary for the maintenance and upbuilding of the body.

SYMPTOMS.

The animals show a lack of thrift. The coat is rough. There is a poor development of the neck and the back is always arched. The animals have a swaying gait. They lie down a great deal and are very reluctant to rise. There is a bending of the legs, a breaking down upon the feet. The face of the animal may be distorted. The animal may be affected with sniffles, or with paralysis, known as weak back. The animal gradually pines away, becoming poorer and poorer. One must remember that this is a slow disease; it does not take the animal in a hurry.

TREATMENT.

As rachitis usually occurs where a balanced ration is not being fed, it is of importance that this be provided for. Professor Rolloff made experiments in which he gave a deficiency of lime salts, which caused a softening of the bones in the pigs, while the check animals fed on foods rich in lime salts remained well. Afterwards, when the diseased animals were fed foods rich in lime salts, they recovered. Similar experiments have been made by Professor Henry and others, who have shown that when hogs were fed liberal quantities of earthly salts the resisting power of the bones was very materially increased. Therefore it is important that this disease be prevented on every farm, for it seems within the power of every breeder so to do. It requires only a few minutes' consultation of the Experiment Station bulletins on pig feeding, or to write to the nearest Experiment Station, for information concerning balanced rations for hogs, and when such rations are fed there is little or no danger that this trouble will make its appearance in a herd. The affected animals should be fed plenty of slacked lime, together with equal parts of charcoal and salt and liberal quantities of either ground bone or bone meal.

ARTHRITIS (INFLAMMATION OF THE JOINTS).

This is an infectious disease of small pigs. It is similar to that known as calf cholera or navel ill in colts. It occurs in pigs soon after birth, usually three or four days. It is caused by the navel of the pig becoming infected. Especially in the spring of the year there is great loss from this trouble, and particularly if it should be a rainy, wet season. The germs enter the navel tract and cause severe inflammation. This usually forms a little pocket or abscess on the abdomen right where the navel enters, and sometimes as much as a tablespoonful of pus may collect at this point. It usually involves the hock, pastern and knee. It is not necessary that more than one or two joints become affected, but often all joints are found to be involved. It may not attack more than a few pigs in one litter, or, if the climatic conditions are right, it may become virulent and large numbers become affected.

SYMPTOMS.

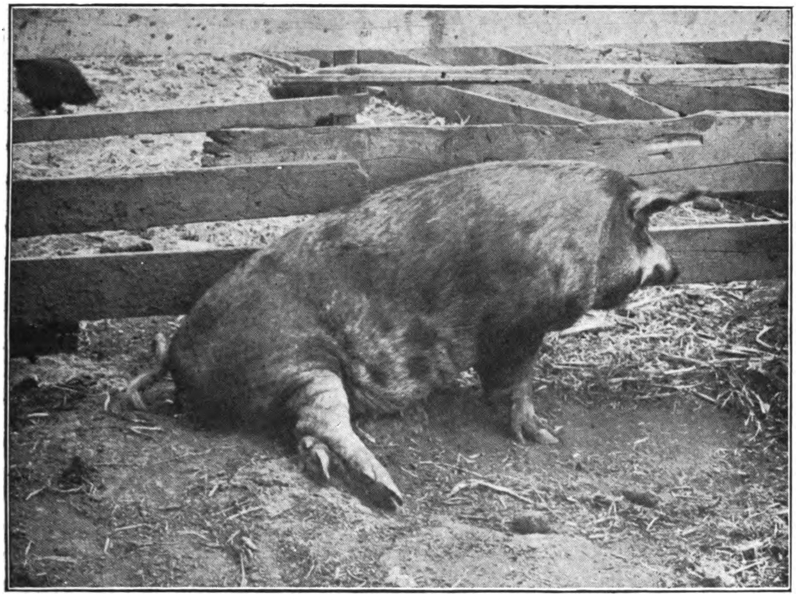
The prominent symptom is severe tenderness of gait, indicating soreness. Upon close examination it will be found that the joints are swollen and hot. The animal has high fever, and diarrhea is usually present. On the whole he shows a picture of dejection, is very weak, and soon dies. The animal may, according to his vitality and the severeness of the affection, live for several days, becoming very much emaciated and hardly able to drag itself about.

TREATMENT.

Medicine is of little avail. Preventive measures should be resorted to. Pens and feed lots where these animals have been housed should be thoroughly disinfected. All the bedding should be burnt and efforts should be made to give the pens plenty of sunlight in order to thoroughly dry and disinfect them. Where this is not practicable, plenty of whitewash, to which carbolic acid has been added, should be used freely. When this disease has broken out in the herd, to prevent its spread among the little pigs the disinfection of the navel should be resorted to. This is done by tying the navel with a string and then painting the navel with iodoform collodion; or, after tying the navel, sear the end with a hot blade, so that it will prevent the germs from entering. If these precautions are taken the loss will be greatly reduced.

PARALYSIS OF THE HIND LIMBS OF HOGS.

One of the diseases of the hog which has been quite an annoyance and caused heavy losses usually manifests itself in mature animals, but very often in small pigs, by paralysis of the hind limbs. The animal at first shows a weakness by walking on its toes, some days previous to the final collapse. It also shows symptoms of pain and restlessness by lying down, getting up again, and moving around, and symptoms of colic. In some, symptoms of rheumatic pains are noticed. In the later stages of the disease the hind limbs become weak. The animal knuckles in the ankles and finally drags its hind parts. The limbs are cold to the touch and the animal has no fever, Appetite is usually good. As the disease progresses the animal becomes weaker and the constant dragging of the hind parts causes abrasions, for the animal will try in the early stages of the disease to move along with the other animals if possible. The appetite does not seem to be impaired. The animals do not, as a rule, make a rapid recovery. Very often when tonics are administered the animals finally get up on their feet again, but, as a rule, they seem to be weak and do not thrive well, and a recurrence of the disease may appear at any time. The disease is usually seen in well-fed hogs. The writer has noticed that this disease attacks some of the best and fattest animals in the herd, either old animals or young shoats. He has found it occasionally in sows that had just farrowed and that were not in the very best of flesh.



Hog suffering from paralysis of hind limbs.

The cause of this disease has been largely attributed to the kidney worm. Whether it is due to this parasite or not, the writer will not definitely state, but his observations certainly contradict that theory, for he has held hundreds of post-mortems in the last number of years on subjects affected with this disease and yet has failed to find in a single instance a kidney worm in animals so affected. On the contrary, he has known of instances in which animals manifesting no symptoms of disease whatever and apparently sound on their feet have been shipped to the packing houses and the kidneys found to be very much diseased (degenerated—containing large cysts); and, therefore, he believes that it cannot be the kidney worm that causes this trouble, for if it were the kidney or the kidney worm we should certainly expect to see one or more kidneys partly destroyed in advanced stages of the disease; and yet these animals during life showed no trouble of this kind. This has often been demonstrated by post-mortems on animals for other diseases, such as hog cholera, which revealed diseased kidneys, the owner never having noticed symptoms of this peculiar lameness. One other cause attributed is the lack of vitality produced by inbreeding, but the fact that should be seriously taken into consideration is that most animals affected with this trouble are not fed on a balanced ration. When this has been neglected it has a tendency to produce a softness of the bones. It is more often found in animals that are being crowded for the market by feeding them large quantities of corn. Whenever mineral matter is not fed to hogs they will surely suffer, and it is for this reason that investigators have found fractures in various parts of the body, in such hogs known as "downers," received at the stockyards. For the purpose of studying this the writer has experiments now in progress, securing from packing houses bones, usually one of the limb bones, from animals known as "downers" and those affected with what is known as partial paresis or kidney worms. The preliminary results already at hand show that the bones of these animals are very soft, breaking at an average of about 180 to 225 pounds pressure, whereas in the case of pigs that were fed on a ration that contained alfalfa and some wood ashes the bones broke at 540 to 560. This shows that the trouble could largely be prevented through feeding, and that if more attention were given to this subject it would mean many dollars to the growers of hogs. From these experiments the writer firmly believes that paralysis of the hind limbs is due to a lack of the earthly salts in the bones and not due to what is known as kidney worms.

Treatment.

Animals should receive liberal quantities of equal parts of charcoal and salt or of wood ashes and salt, and plenty of slacked lime. If any one in the neighborhood is plastering a house and you could secure some of the plaster that is left, it would be valuable to throw around in the feed lot. If this cannot be secured, lime water should be given at least once a day. A perfectly balanced ration should be fed, and, in addition, liberal quantities of ground bone or bone meal. As to operative treatment, such as blistering, the writer has not had good results and therefore does not recommend it.

RETENTION OF URINE.

When the flow of urine is hindered by accumulations of urinary calculi, which is especially the case in oxen and bucks and swine on account of the S-shaped curvature of the penis, the bladder often bursts or necrosis of the affected parts of the urethra sets in, in which case the urine is often voided into the abdominal cavity.

SYMPTOMS.

During life the animal appears very sick and indifferent and the exhaled air has a urinous odor. Upon post-mortem the blood, internal organs and the muscles have the same odor. In mild cases the odor is scarcely perceptible, but it is again noticed in cooking the parts. Between the muscles under the skin there are often fluids which cause irritation and have a strong urinous odor. In cases where the bladder bursts, the abdominal cavity is filled with urine and there is inflammation of the peritoneum.

JAUNDICE.

Jaundice is a yellow discoloration of tissues due to swellings of the bile ducts (from catarrh of the small intestines, gall stones, parasites, etc.), whereby the bile instead of entering the intestines is taken up by the blood. Jaundice may appear as an accessory to other diseases in which there is a degeneration of the red blood corpuscles.

SYMPTOMS.

The yellow discoloration appears in the liver, kidney, connective tissue, skin and mucous membranes. In severe cases the cartilage, pleura and peritoneum are yellow and discolored (greenish or whitish yellow). It is also to be borne in mind that jaundice can only be diagnosed by daylight; artificial light gives all animals affected with this disease a white appearance. In very extensive cases of jaundice, animals, especially swine, often look white in daylight. As a rule, healthy swine can be distinguished right after slaughtering by the pink color of the fat, which is absent in affected ones. In doubtful cases it is advisable to compare suspected animals with healthy ones. In removing the entrails it often happens that the gall bladder is injured, causing the contents to contaminate the inner walls of the abdomen and thorax, also the neck. In such cases the upper layers are discolored, which can be easily verified by making an incision into the same. Sometimes, especially in swine, there is a yellow discoloration on the ham and in the region of the shoulder caused by an injury, a sprain, or a broken bone in those parts.

PYÆMIA (BLOOD POISONING).

Suppuration is caused by various bacteria and occurs in different forms. On the mucous membrane, pus forms on the surface and is very easily discharged (suppurative catarrhal fever). In suppuration of the pleura, peritoneum, or joints, pus accumulates in the abdominal or thoracic cavities, or in the joints. In suppurating organs the pus either infiltrates the tissue or it concentrates in large quantities in a certain place and forms a purulent mass or abscess. As a rule, suppuration is limited to the seat of infection. The pus either erupts externally, flows off and the parts heal, or the mass of pus may be enclosed in a capsule. In exceptional cases there may be a generalized suppuration which is caused either by dissemination through the lymphatic glands or vessels to the blood, or the pus may penetrate into a vein and thus enter the general circulation. In the latter case the pus is first taken by the blood through the right ventricle to the lungs, then through the general circulation all over the body; for instance, in the liver, spleen, kidneys, joints, muscles, etc. New abscesses will be seen far from the original seat of infection, which in turn may cause other abscesses. In some cases there may be purulent inflammation of the marrow of the bones. This general infection of the blood in the general circulation, the pus being carried to the organs and forming abscesses, is called pyæmia (suppurative blood poisoning, suppurative fever).

Symptoms.

During life the symptoms are not very marked. Intermittent fever with chills or rigors exists with a general diseased condition. The affected animal is generally seen hiding in weeds, under strawstack or in some cool, quiet place.

Post-mortem examination reveals the original suppurating mass, and in most cases also new abscesses in other organs, especially the lungs. Besides these the other internal organs (liver, spleen, kidney, mucous membranes of the stomach and intestines, and muscles) are softened, swollen and inflamed. Pyæmia is not always fatal, but recovery is rare.

ABORTION.

This may be caused (1) by accident, or (2) by infection. Under the head of accidents we first wish to mention the one which causes a great number of sows to lose their pigs, and that is slipping on extremely slippery floors or on ice. Sows also lose their pigs when allowed to be with animals that are vicious and continually fighting them. Overexertion in the summer with the consequent overheating is another cause for accidental abortion. The statement is often made that bad food, such as sorghum and the like, produces abortion, but the writer is inclined not to credit this. It may be that large amounts of cottonseed meal would produce this trouble, but the writer doubts whether clean grain, such as sorghum and the like, need be feared.

Infectious Abortion.

Sows become infected chiefly by the boar not being properly disinfected, for it is from this source that the contagion is conveyed to them. If both boar and sows are properly disinfected, however, the contagion can be largely prevented. Whenever a sow aborts she should be thoroughly disinfected. This disinfection should consist of placing the sow in a crate and then irrigating the entire vagina at intervals until there is no more discharge coming from her. It is also important that when this sow is ready to be bred again, if she is a valuable one, she should be disinfected a few hours before service. First irrigate the vagina with a lukewarm solution of soap and water and then inject an antiseptic solution of permanganate of potash 1 tablespoonful to 3 gallons of water. It is well to separate an animal so affected from the rest of the herd until the possibility of infection is eliminated. In addition to this the premises should be thoroughly disinfected. The disinfection of the boar is very difficult and cannot be so easily performed as the disinfection of the bull, and yet by placing the animal in a crate and placing a surcingle or some support under him to prevent him from lying down this can be accomplished very readily.

INFLAMMATION OF THE UDDER.

This is caused largely through injury of the teat by the little pigs. It is also caused in heavy milkers by allowing the sows to become chilled, especially in the spring and fall of the year. There is probably nothing that is so difficult to handle as a quarter that has become badly inflamed. The operation for these bad udders has not been very successful, for the reason that hogs do not stand the shock of an operation very well. As soon as the affection is noticed it is well to use hot fomentations. This can be done by applying to the affected parts wood wool (oakum) or a sack of oats or bran which has been dipped in real hot water. Then dry and apply an ointment made up of 5 grams of ichthyol and 50 grams of vaseline. The hot water treatment should be kept up for some time. For the reason stated, the writer would never advise using the knife. By the use of green soap, applied hot to the affected parts with a brush once every day, good results may be obtained.

BARRENNESS.

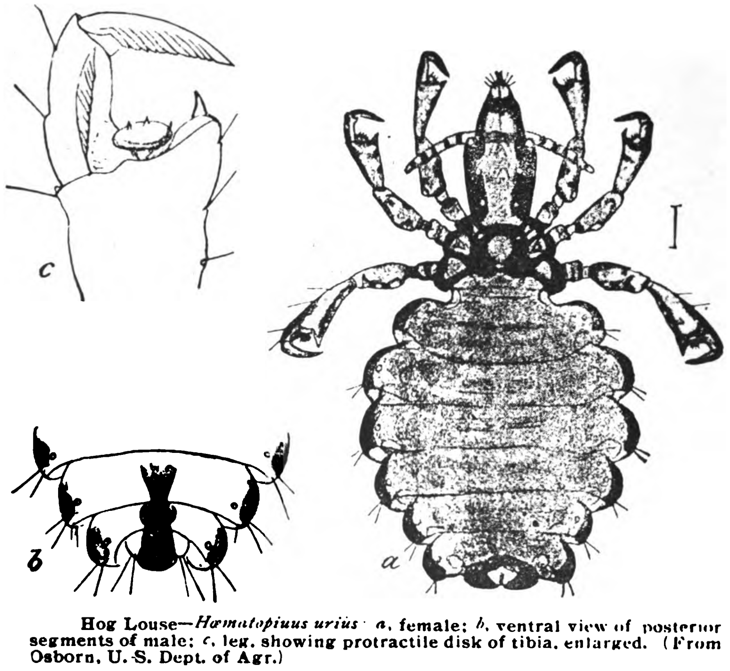
This occurs very often in hogs after accidental or infectious abortion, and it can be largely attributed to the fact that when abortion occurs the placenta (afterbirth) does not usually come away, but causes a sloughing which continues for some time and produces a derangement of the membranes of the vagina. It makes the vagina become highly acid and on this account the sow is prevented from conceiving.

TREATMENT.

The treatment should be to prevent acidity and should consist of the following: The sow should be irrigated with a weak soap solution—say twice a week for at least two weeks before breeding. After the soap solution is used to cleanse out the mucus adhering to the membrane, the solution should be injected the same as recommended for abortion in the preceding chapter. This treatment aims to reduce the irritation and should be tried by all who have sows in this condition.

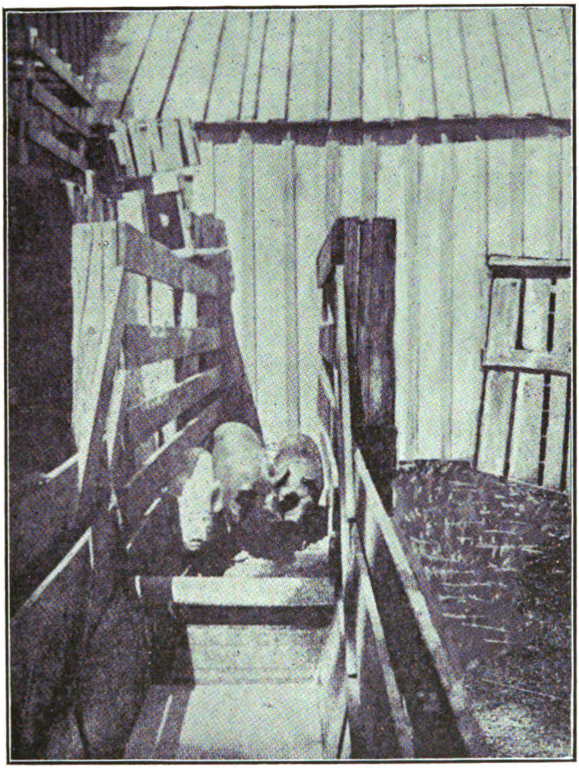
LICE.

Lice on hogs is a very serious problem. It is a fact that very few hogs are free from these insects. Their favorite seat is back of the ears, along the neck, and under the breast. These vermin are bloodsuckers and in a short time produce a very weak condition in the animal, thus making the animal susceptible to other diseases. They cause considerable discomfort and unthriftiness in hogs and as a result heavy losses occur annually. These insects are liable to appear at any time of the year, for the warmth of the hog is sufficient to hatch the eggs.



Hog Louse—*Hæmatopinus urius* a, female; b, ventral view of posterior segments of male; c, leg, showing protractile disk of tibia, enlarged. (From Osborn, U. S. Dept. of Agr.)

On account of the louse being a bloodsucking animal it is not necessary to apply a poison for the destruction of the same. Any decoction that can be made so that it is soapy or oily will stop up the pores of the louse and thereby deprive it of the air that is needed and it soon dies. Understanding this simple method by which the louse is killed, it becomes easy to devise some means for its destruction, and therefore it is not necessary to apply a poison. There are any number of remedies on the market that can be used effectually for the destruction of the pest. Many breeders recommend coal oil. This, of course, has a penetrating power, but it is not so effective as when made into an emulsion or when mixed with some oily substance, such as oil or grease. With all the remedies on the market it is quite a problem to keep ahead of the lice, for the nits hatch very fast. Many breeders use a coal-tar solution and go over their hogs with a sprinkling can during feeding time, aiming to wet the back of the ears and flanks with the solution. Others simply use coal oil, mixing it either with a soapy emulsion or with some oil. When hogs are accustomed to being handled, this is a very handy way and quite effectual; but where they are not used to being handled, they are not quiet and it becomes necessary to place them in a small enclosure and then spray or dip them. Spraying or dipping hogs is at all times advisable, as it is the only safe and rational thing to do if they are infested with lice.



Just ready for the plunge.

There are a number of dips on the market that have given very good results, such as Creogen-Martin, krezo, zenoleum, and chloro-naptholeum. The coal-tar dips make a very fine emulsion. The coal-tar solution should be made in the following proportion, which is usually recommended: 1 part of dip to 75 parts of water. Soft warm water is preferable, as it forms a better emulsion. More satisfactory results are obtained when dips are used warm, for their penetrating power is far greater than when used cold. Cold water and hard water do not readily emulsify and therefore do not give the results wished for. When soft water cannot be obtained, hard water can be softened as follows: Take 3 pounds of hard soap or 10 pounds of soft soap, and 1 pound of washing soda, and boil with about 25 gallons of water until all is well dissolved. This can be added to every thousand gallons of the dip solution. When these rules are carefully followed the lice problem will not be so difficult to handle. Spraying or dipping, however, does not suffice alone. Thorough disinfection of the breeding pens and stables should be insisted upon. The hog pens must be thoroughly cleansed and the bedding and all the litter burned. The coal-tar preparations make excellent disinfectants when used at the required strength. The water should be as hot as one can comfortably handle it. The disinfectant should reach every part and all the cracks, in fact everything that may have been exposed or in any way contaminated by the affected hogs. This is by no means easy work. It requires care and persistence. It is on account of the slack way in which the hog pens are disinfected that so many failures are reported by persons not having had the desired results from dipping or spraying. These failures can be wholly attributed to the fact that the parties did not thoroughly disinfect the hog pens, the bedding, and in fact everything that the infected hogs could contaminate. To sum it up, in order to have good success with dipping, everything that the affected hogs could possibly contaminate must be disinfected, either with slacked lime or with one of the coal-tar preparations.

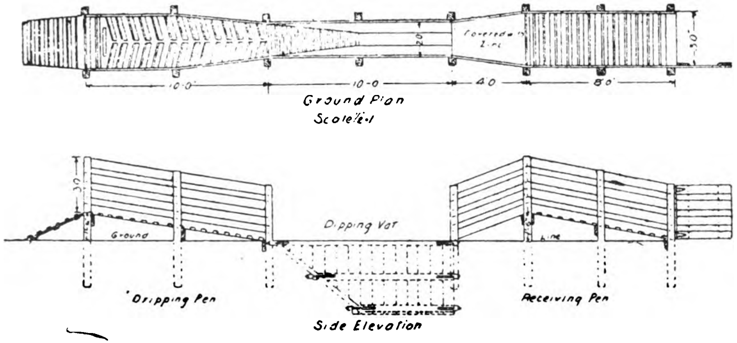
Those who do not wish to buy the dip can make the following kerosene emulsion, which has been used with good success:

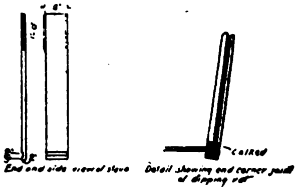
Hard soap or whale oil	**½ pound**
Water	**1 gallon**
Kerosene	**2 gallons**

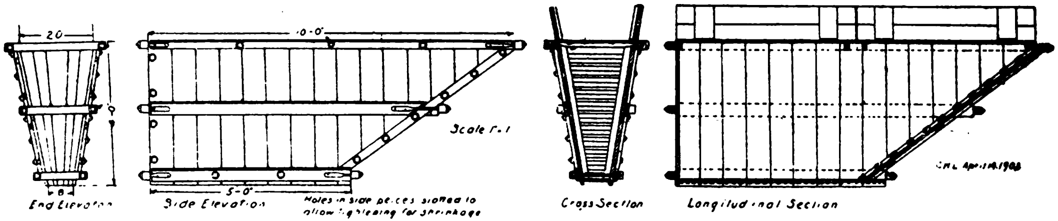
Dissolve the soap in boiling water and, while still hot, add the kerosene and agitate thoroughly until cool, when the stock emulsion thus obtained should be of the consistency of thick cream and without the presence of free kerosene. When ready for use dissolve in about twenty times its volume of water.

Dipping speaks well for itself. Breeders who have put in a dipping plant and have dipped faithfully once a month, many dipping oftener than that, have found that it leaves the skin in a soft and pliable condition, which is of great importance. Many breeders have testified that since they have dipped their hogs it has prevented hog cholera from gaining a foothold in their herd. It is also a fact that it aids a well balanced ration, for the hogs are in a better condition to assimilate their food. It is a fact that all breeders cannot put in a dipping tank, but those who cannot should use the sprayer often and place posts in the feed lot, wrap them with burlap, and then grease them or soak them with some of the dips. These posts enable some of the hogs to rub

PIG DIPPING TANK.




8"
15-0
End and side view of stave
Calked
Detail showing end corner joint of dipping vat



themselves and aid wonderfully in keeping down the pest. Every farmer who raises hogs should provide three or more posts for them. These posts are cheap and can be maintained at a very little cost and labor.

The following is the plan and specifications for erecting a pig dipping tank: A galvanized tank can be built by any tinner or can be purchased on the market, and may be used in place of the wooden one, but the setting and approaches will remain the same. The iron tank is highly recommended on account of its cheapness and durability in all kinds of weather and climate. A wooden tank will require 240 feet 2 by 12 tank lumber, 12 feet 4 by 6 white pine or tank timber, 40 feet 4 by 4, 16 feet 2 by 6, 16 feet 2 by 4, 24 feet 3 by 4. For the approaches and dripping board will be required 10 feet 2 by 12 tank timber, 100 feet 4 by 4 yellow pine, 60 feet 2 by 6, 114 feet 2 by 4, 162 feet fencing, 17 pounds 20-penny nails and 7 pounds 10-penny nails, 10 square feet of zinc, 4 T hinges 8 inches. A canvas curtain hung at the juncture of the crowding pen and the slide will serve as a blind and facilitate the driving of the animals. All details of construction may be ascertained from the accompanying Figure on preceding page.

MANGE.

Mange is a parasitic disease. It is caused by the parasite burrowing under the skin. This produces considerable irritation, which eventually destroys the skin and produces a scab. The burrowing of the parasite causes intense itching, and on that account the animal rubs itself and causes the parts to become rough and sore. This affection is first noticed on the thin parts of the skin, namely, under the thigh, under the arm, and behind the ears, and at times upon the back. In the advanced stages they invade the entire body. This affection is highly infectious, for the reason that one animal will contaminate another in very short time; therefore it is important that all affected and unaffected animals be immediately separated to avoid contamination.

TREATMENT.

The disease yields readily to treatment. Washing, spraying, or scrubbing the animal with any of the coal-tar dips, or dipping them, usually suffices. With this disease it is as important as with treating hogs for lice, that the premises be thoroughly disinfected, for if this is not done reïnfection takes place.

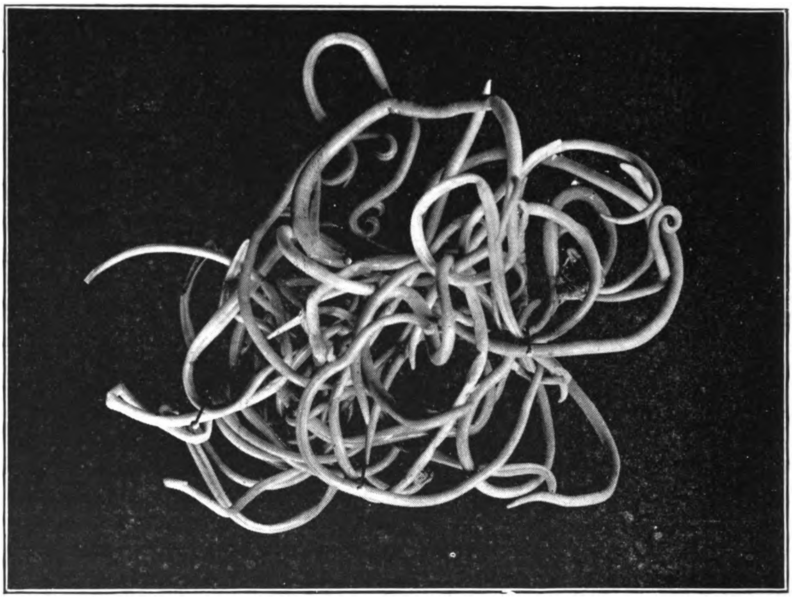
PARASITES.

The term parasite is applied to a living organism that lives upon another living organism. A parasite may belong either to the plant or to the animal kingdom. It may live on either an animal or a plant, from which it derives its nourishment for a part or the whole of its life cycle. The plant or animal on which the parasite lives is called its host. Parasites are, as stated, either of an animal or vegetable form. Some live outside of the body and some live inside of the body, and are accordingly termed external and internal parasites. Some parasites live their whole life on the host, but the great majority spend only a part of their life there. Almost all of the lower forms of animal parasites must pass through different forms during their life cycle. This stage of change or incubation is called metamorphosis. There are usually three separate periods: first, that when the egg is hatched; second, when it reaches the larval state, or better known in insects as the caterpillar stage, often called grub or maggot; from this form it usually changes into a third, namely, the pupa or chrysalis stage, and from this to the adult state. For a good illustration the reader is referred to the butterfly. This insect is familiar to all, and like this insect the parasites pass through a metamorphosis state. However, some pass through a number of different stages in different animal hosts, while still others pass through only one transformation and some do not pass through any. This will be taken up more fully when the parasites are discussed in detail.

A number of authors state that swine are a great deal more susceptible to animal parasites than other farm animals. This the writer hardly believes to be a fact, for he believes that when a more thorough investigation has been made other animals, especially the sheep, dog and cat, will be found to harbor many more parasites than swine. However, it is bad enough as it is, for hogs are infested by a large number of intestinal parasites. Fortunately, however, they do not seem to be so disastrous to swine as they are, for instance, to sheep, for it is a fact that the greatest loss occurring in sheep is due to parasites, the sheep industry in some of the eastern states having been practically abandoned by reason of the severe loss from parasitic diseases. The intestines of swine harbor the greatest number as well as the most harmful parasites.

We will first take up the little roundworm (Ascaris suilla Duj.) found in swine. This worm is commonly called the roundworm and is one of the worms most frequently found. Although occurring in great abundance it does not seem to do a great deal of damage. It is a large, long, round worm that tapers towards both ends. It is found in the small intestines, but may also be seen in the large intestines and in the stomach. It loosely attaches itself to the intestinal wall by its mouth. The males are from 6 to 7 inches long and the females from 8 to 10 inches. They are of a dark yellowish-white or of a reddish-brown color. It is not uncommon to find these worms even in the common bile duct or some may enter the gall bladder. The writer has also found them in the lobes of the liver, that is, when they were found in great abundance in the small intestines. These are the most common worms found in the young pig and they may completely obstruct the intestine. They are usually found in the young, unthrifty pig. They produce a general unthriftiness among young pigs weighing from 40 to 120 pounds, and the trouble is often mistaken for cholera and swine plague. On account of the presence of this worm we find a popular notion that these parasites have something in common with hog cholera and swine plague. This is a very erroneous idea. The vitality of the host is reduced by harboring these parasites, and it is on this account that these symptoms are found. It can be stated safely that over 50 per cent of the hogs slaughtered in the Mississippi valley are infested with this worm and often to a larger extent. Professor Kaupp states that he has "seen these worms so numerous that the intestines for as much as two feet would be considerably distended with them," and the writer has frequently seen cases where the entire lumen of the intestine was filled with them. But it is probable that the worms collected in these masses after the animal had been killed. Certainly such a condition could not have existed for any length of time prior to death without having produced clogging and inflammation of the intestine, whereas the intestine seemed to be in a healthy condition.

There seems to be no doubt that the large number of parasites present must reduce the vitality of the host (by absorbing a great quantity of the food consumed) and otherwise preventing good, healthy assimilation of food in the pig. Aside from this they must cause great irritation and thereby disturb the digestion and deprave the appetite so that the pig will not make the gains that it should on the amount of food consumed. Further, it must constantly place the pig in such a position that it will be more liable to contract contagious diseases should the animal be placed in position for infection, such as coming in contact with diseased herds, etc. It is safe to say, from the number of hogs infested with this worm,



Large Round Worm, found in intestine.

Ascaris suilla (Duj).

and from the debilitating effects it produces and the large per cent of hogs constantly fighting for existence and warding off diseases, that this worm is directly and indirectly responsible for the heavy loss that occurs annually in the hog growing districts of the United States.

SOURCE OF INFECTION.

The eggs are passed with the excreta and dropped on the ground, and either the eggs or the embryos hatched from them are eaten with food by other hogs and these hogs are then infested. It is, however, necessary for the ground to be moist and warm for the hatching of the eggs, and yet it has been found that they have great resisting power and that they can withstand heat and extreme dryness. On account of the ground becoming infested with these eggs it is extremely dangerous for hogs to root or to have the habit of eating large quantities of earth, because they are more liable to become infested. It is also a fact, as can be readily seen from the above statements, that where a herd is free from worms one individual hog that is infested can contaminate the presence so that it will be but a short time before the entire herd will become infested with these terrible parasites, and it is in this way that the parasites have spread over such large territories and that such a large per cent of hogs is found to be infested. When purchasing hogs it is therefore important not only to quarantine them and examine them for hog cholera, but also to ascertain whether they are infested with any of these parasites. The further fact that a large number of hogs are constantly feeding on earthen floors, or on very dirty floors, or in lots where they have stagnant water, makes it a very easy matter for the average hog to become infested with these parasites, for the feeding troughs and drinking troughs constantly become contaminated with these eggs and the hogs are continually taking up fresh infection with each feed. It seems that the things to be taken into consideration are the disinfection of the pens and the adoption of better hygienic measures.

SYMPTOMS.

Unless the pig is infested with a large number of worms there are no marked symptoms. But whenever pigs are kept under unfavorable conditions, where the feed lot is dirty and wet and where the infested animals can infect the feeding troughs and the watering troughs, then there will be a marked retardation in growth and these pigs will be infested with a large number of parasites which materially assist in hindering the growth of the hog. An animal in this condition is usually termed "stunted," for, as stated, whenever worms are present in large numbers they cause a disturbance of the digestive tract and impair assimilation and finally produce chronic indigestion. It is well, whenever examining hogs for parasites, to ask the owner or attendant if any parasites have been seen to pass with the feces. This helps in the diagnosis. As stated, the pigs most frequently affected are those weighing from 40 to 120 pounds. In older hogs parasites are seldom present in sufficient numbers to do any harm. Symptoms of nervousness and of cholera may often be present.

Dr. Youngberg, of Lake Park, Minn., records in Vol. XVII., p. 478, of the *Journal of Comparative Medicine and Veterinary Archives,* an outbreak of this trouble in swine. He gives the symptoms as follows: "Hair standing upright; very much emaciated; some were coughing; others paralyzed and unable to walk." Two were destroyed and a necropsy revealed the fact that they were badly infested with this worm. Treatment was given, with the result that the worms were destroyed and the pigs recovered.

It is not impossible that some of the outbreaks that are supposed to be cholera are due to this worm instead of to the cholera bacillus.

TREATMENT.

This should be largely preventive, for more can be accomplished by strict hygienic measures than by treatment. Sanitary conditions on the farm should be looked into thoroughly. The hog lots should be well disinfected. If there is insufficient drainage of the water found in the hog lots, this should be looked after at once. Hog wallows should not be allowed unless disinfecting fluids are freely sprinkled in the water. Pools should also be disinfected. The feeding troughs should be washed with hot water, to which a disinfecting fluid, such as carbolic acid, lime water, or the like, has been added; or, better yet, place the troughs over a small amount of burning straw so as to char them and subject all the crevices to the heat. The feed lot, stable and pens should be thoroughly scraped and the litter burnt. When hogs are given medicinal treatment, it is well to give the pens plenty of bedding so that when the parasites and the eggs are dropped with the feces they will not, to any great extent, contaminate the floors, but will adhere to the bedding and in this way can be burnt.

For treatment there is possibly nothing better than coal-tar creosote or turpentine. Other drugs may be mentioned, but the writer does not believe there is anything better than coal-tar creosote given as follows:

Coal-tar creosote	1 ounce.
Water	99 ounces (6 pints and 3 ounces).

One ounce of this is a dose for a full grown animal and is best administered with the morning feed. Or, you may give them turpentine or gasoline, which should be administered in the swill, and best on an empty stomach. The best way to feed this medicine is to omit the morning feed and give a tablespoonful in the feed for an average hog. Two or three applications usually suffice. If you wish to drench the animal instead of giving it in the feed, use a drenching tube. A drenching tube may be made by taking an ordinary tin funnel and rubber tube or hose, say three feet long and three-eighths to half an inch in diameter. Into this rubber tube insert the lower end of the funnel, and then drench the animal by placing the rubber tube between the animal's back teeth, allowing the hog to bite on it. It is also well to place a piece of metal at the end of the rubber tubing, so that the animal may bite on it continually without stopping the flow of liquid by pinching the rubber hose. It is of great importance not to close the patient's nostrils while drenching.

Turpentine may be given with either flour water or with milk, a teaspoonful to every 60 to 100 pound hog. Santonine may also be given, but the writer does not recommend it, because a slight overdose of it is poisonous and may kill the hogs. The best results have been obtained from coal-tar creosote. These medicines should be given on a partly or empty stomach.

ECHINORHYNCHUS GIGAS (GŒZE).

This is a large parasite and one that, no doubt, does more harm than any of the others. It is found in a large per cent of hogs and in great numbers. The body is milk white, sometimes tinted. The posterior end is somewhat smaller. The male is about 8 inches and the female 8 to 10 inches long and about ¼ of an inch in diameter. It is largest at the head, gradually tapering towards the tail. The proboscis is armed with five or six rows of hooks. These can be retracted at will. The adult worm is found in the small intestine of the pig. It is usually hitched to the walls by the aid of the hooks. It is found in all the packing houses of Europe and of this country. Professor Neumann has the following to say about this parasite in France: "These worms cause considerable trouble in swine. The symptoms are as follows: Loss of appetite, constipation and restlessness; the animal will paw and burrow and apply the snout or teeth against the sides; the pig keeps growing thinner and thinner; there may be convulsions and fits, and young pigs may die in three or four days. Frequently the disease becomes epizootic." While this worm is very common in this country, we have no record of such a condition prevailing here. This has not been observed by the meat inspectors in this country. As stated, this parasite is found in a large per cent of hogs slaughtered. Dr. G. A. Johnson in a recent paper stated than after a careful investigation of some 11,000 hogs it was found that 24 per cent of these 11,000 were infested and that the average hog contained from forty to sixty of these worms. It would seem from the anatomy of this worm that it would cause intestinal disturbance, for it attaches itself to the walls of the intestines and injures them to a large extent so that they cannot be used for casings. Judging from the large number of parasites that are found, they certainly must interfere with the digestive processes. The life history of this parasite is as follows: The adult echinorhynchus gigas lays a large number of eggs in the alimentary canal, which pass out and are spread over the ground with the manure. These eggs are eaten by some insect and hatched in its intestines. They may be eaten by the larvæ. On reaching the intestinal canal of a suitable larva, as the white grub seen in manure piles, the egg hatches and the embryo echinorhynchus gigas passes into the tissue of the grub, where it remains in a somewhat cystic form throughout the various changes from the grub to the beetle. In this condition they remain and may even live through the metamorphosis of the insect until the host is eaten by some pig. If it finds its way into the alimentary canal of a pig the digestive fluids will dissolve the cysts and the embryo is set free and attaches itself to the mucous membrane until it reaches maturity. The authors on parasites differ as to what insect is the intermediate host. The larva has been found in the May bug, and the June bug has also been experimentally infected. Some claim that snails harbor this host. From many pigs infested with this worm it is certain that more than one host must harbor the larvæ. It will be seen from the study of this parasite that thorough preventive methods can do a great deal more than curative measures. When the preventive measures recommended above for the small roundworm are adopted the pigs can be more easily kept free from this trouble.

RINGWORM.

Ringworm is a parasitic disease that affects the ears, back and croup. It is carried by a small vegetable parasite to the epidermis. It makes its appearance in patches. These patches are at first moist and have a grayish appearance. Later they dry up without forming any postules. This disease usually runs a chronic course and is seldom accompanied by much itching.

TREATMENT.

This disease yields rapidly to treatment. The affected parts should first be thoroughly cleansed and may then be treated with a little oil or any grease.

URTICARIA (NETTLE-RASH).

This disease resembles mange very much. It is also known as nettle-rash. It is characterized by an elevation of the skin, which is reddened. The cause of the disease is a deranged digestion. Some breeders believe it is produced by feeding too long on one kind of food. Others believe that the starchy foods are more apt to produce this trouble. It is most commonly observed where great quantities of swill are fed, especially swill from hotels.

SYMPTOMS.

Elevations of the skin appear, which cause a great itching. These elevations may appear on any part of the body. They may remain for a long time or only for a short period. The animal appears dull. When these elevations are first noticed they are always accompanied with an intense itching. This, too, may last for only a short time or may continue until the trouble has been alleviated.

TREATMENT.

The treatment consists of a change of food, placing the animal on a light diet which contains charcoal and salt and adding to the feed or drinking water half a cupful of a 10 per cent copper solution twice a day for fifty hogs.

MEASLES.

Measles, as commonly described in the text books, is one of the diseases that is similar to hog cholera. It presents many of the symptoms of cholera and in the early stages is not easily distinguished from that disease. Measles is closely associated with another disease that is described in the text books as erysipelas. This is practically another name for hog cholera. Erysipelas really includes hog cholera, measles, scarlatina, pig typhoid, gastro-enteritis, and diphtheria of swine. In Europe erysipelas in pigs is recognized as a distinct disease, and there is no distinction made between it and hog cholera. In England it goes under the various names of swine fever, swine plague, and hog cholera, and in the United States it should only be called hog cholera (swine plague). A minute description of this disease will be given under hog cholera and swine plague.

EFFECTS OF HOTEL SWILL ON HOGS.

On the average farm this is not of much importance, as the swill coming from the owner's household does not contain very much caustic material, but whenever it is gathered from the boarding houses or the large hotels in the city and fed to swine, it then becomes a source of danger. Enterprising stockmen have thought that it would be economical to use this by-product, and so farmers close to cities have tried to feed large numbers of hogs with this by-product, but they have been universally unsuccessful, owing to the fact that the caustic material, the alkali (washing soda), that it contains is very injurious when fed in any quantity. The Cornell Experiment Station made some experiments in 1897 and found that when about two to three ounces of soap was added to the feed it would produce weakness among the pigs. It is true that small amounts of soap do not produce serious disorders immediately, but later on, when the system becomes more permeated with it, ill effects are produced. Further, it is dangerous to feed garbage and swill, for it increases the danger of infectious diseases, such as swine plague and hog cholera. The enormous mortality among garbage- and swill-fed hogs should be a warning against this practice.

POISONING.

Poisoning very often occurs in domestic animals.

Symptoms.

These vary according to the kind of poison taken up by the animal. As a rule, sudden, severe sickness with symptoms of great weakness, paralysis, cramps and the like suggest poisoning. The animals usually die. The pathological changes which are present upon post-mortem vary according to the nature of the poison. Poisoning by nerve poisons, such as morphine or strychnine, cause no pathological changes. Corrosive poisons, such as acids, arsenic, phosphorus, etc., cause inflammation or intense irritation of the alimentary canal. In administering medicines which have strong odors, such as petroleum, camphor, oil of turpentine, and the like, the flesh will have the same odor many days after death. Some poisons, such as chloroform, chloride of lime, etc., cause the blood to become thin and decompose. In still other cases of poisoning there is a septic condition of the blood.

SUNSTROKE AND HEATSTROKE.

During the hot weather, hogs that are kept on pasture and not provided with sufficient shade suffer from sunstroke. Hogs that are driven on a very hot day are easily overcome by heat.

The first symptoms are fatigue, drooping of the ears and a staggering gait, which end in collapse and unconsciousness. Convulsions are seen in this stage and death occurs in a very short time. Hogs should be provided with ample shade during the daytime. It will aid materially in the feeding of the herd—they will do much better. No animal can stand the rays of the sun so little as the hog, therefore hog men should provide sufficient shade for their hogs. Hogs that are not given this luxury suffer severely during the heated hours of the day, and for this reason do not put on much flesh.

In the summer, hogs are usually troubled more with vermin than at any other time. They should be dipped or sprayed often. When they cannot be dipped the sprayer should be used, and if this cannot be done, there is no reason why posts cannot be put into the ground and then wrapped with burlap, which is saturated with a disinfectant. The hogs will rub themselves and in this way take care of the lice. Some stockmen oil the burlap instead of using a disinfectant, for even grease will keep away lice.

Too much cannot be said about keeping hogs in cool, shady places during the heat of the day. It will be a surprise to the owner how much better they will do. Breeders must remember that feeding is not all that is required by an animal, but that some attention should be paid to its comfort.

UNIV. OF CALIFORNIA

THE EFFECT OF COTTONSEED MEAL.

Cotton seed meal cannot be fed to hogs in large quantities without producing ill effects. A number of experiment stations have made experiments in the use of this food in addition to grain rations, and have found that when large quantities were given it produced injurious effects among the herd. The Kansas station found in one experiment that all the pigs to which they fed cottonseed meal died within six weeks. Professor Henry of the Wisconsin station fed small amounts in one experiment and did not notice any ill effects. The Texas experiment station found that ten out of twenty animals died within seven to ten weeks after the feeding of cottonseed meal was commenced. The following is quoted from one of their experiments:

"Sickness and usually death uniformly occurred within a period of six to eight weeks from time of first feeding cottonseed or cottonseed meal. In tests for 1892 the feeding began February 8, and the first death occurred March 23—exactly six weeks later. In tests for 1891 feeding began January 20, and first death occurred March 13—almost exactly seven weeks later. In the outbreaks noted as occurring in the college herd the trouble began each time in less than ten weeks from the time of feeding cottonseed meal. The trouble continues for a period of about thirty days, and those animals which are not attacked within that time may safely be regarded as cottonseed proof. Following our tests for 1891, several of the shoats which were not attacked in the spring were kept all summer on a diet largely cottonseed or meal; but beyond a practical stoppage of growth and consequent permanent stunting of the pigs no injurious effects resulted.

"It is noticed that in tests for 1892 the medium and the small-sized shoats in each of the different pens were the ones which suffered most, the large-sized shoats in all of the pens resisting its (cottonseed or meal) effect and coming through safely. * * * Two out of three were lost from each pen, except the boiled-seed pen, where only one died. (In 1891) in the cottonseed meal pen every hog (five) died within ten days after sickness first appeared. In the roasted-seed pen four out of the five succumbed, and in the boiled-seed pen but one was taken.

"It is, of course, needless to state that the corn-fed hogs in no case showed any signs of sickness whatever. The fact that much the lightest death rate was observed on boiled seed each year, and the single death that did occur each year was latest as compared with all the deaths recorded, would indicate that thorough boiling has the effect of lessening danger in the use of cottonseed for hogs."

From the above it would seem that cottonseed meal should be fed with great precaution to hogs. The writer has, however, observed that where small quantities of cottonseed meal were fed no ill results were produced. Therefore, when it seems advisable to add this to the ration it should be given in very small doses.

COCKLEBURS.

The writer does not think it is necessary to describe the cocklebur, for this weed is known to almost all farmers. It is very common. It is a troublesome weed, both in the pastures and fields, and it is seen more in hog lots than have been abandoned for a time. This weed is considered poisonous. The writer does not recall any cases of cattle or horse poisoning from this weed, but he has made a number of examinations where he was positive that the hogs died from cocklebur poisoning. The examination would always reveal that they had eaten large quantities of the young juicy burs. It is claimed by chemists that the whole plant as well as the burs contains a poison which affects principally the heart's action. To substantiate the writer's theory of cocklebur poisoning, whereever he was called to investigate cases of this kind, and wherever he suspected cockleburs to be the cause, he took steps to clean the pasture from this weed and prevent hogs from coming in contact with it, and, as a result, there were no more losses on these premises. This, and the fact that the post-mortem examinations revealed the presence of the cockleburs, led the writer to believe that they caused death. It is advisable to prevent this weed from growing in the feed lot where hogs are kept and to prevent hogs from pasturing where it is found.

State

Board of Live Stock Commissioners

# of Illinois

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What the Farmer Should Know About Consumption or Tuberculosis in Cattle or Man

By DR. J. M. WRIGHT,
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STATE HOUSE
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WHAT THE FARMER SHOULD KNOW ABOUT CONSUMPTION, OR TUBERCULOSIS, IN CATTLE AND MAN.

WHAT IS CONSUMPTION OR TUBERCULOSIS?

Consumption and Tuberculosis are two names for one disease. The disease is caused by the growth and enormous increase in number of an exceedingly tiny plant in the body of a person or an animal. This very, very small plant is called a bacillus, and is so small that it can only be seen by most powerful magnifying glasses. It is spoken of as the consumption germ or tubercle bacillus.

The presence of this germ in the body does not always cause consumption to start. When the germs of consumption get into the body a struggle takes place between the germs and the cells of which the body of animals and man is made up. If the cells of the body are victorious, the disease does not develop; if the germs are victorious, little tumor-like knots, called nodules, are formed, and the parts of the body where the disease is going on loses its natural appearance. This is Consumption or Tuberculosis. It is so called because the germs in their growth " consume " the parts of the animal body where the disease is advancing.

WHAT PARTS OF THE BODY DOES CONSUMPTION AFFECT?

Though consumption affects the lungs of cattle, hogs and man very commonly, it often also affects other parts of the body, such as the liver, the bowels, the " kernels " (or lymph glands), the bones, the skin, the eye, the coverings of the brain—in cattle the bag, or milk glands, are often affected.

WHY IS CONSUMPTION, OR TUBERCULOSIS, IN OUR FARM ANIMALS OR MAN, ESPECIALLY DANGEROUS?

The little knots, or tubercles, soften and break down and the material of which they are composed gets outside the body into the outside world. In man the material is coughed up into the mouth. Though cattle often cough up this material, they do not, as does man, spit it out. Instead of that they swallow it again and it passes into the stomach. This material usually contains millions of consumption germs, and cattle pass immense numbers in their manure.

This consumptive material that a man with the disease spits up, which contains large numbers of the germs, dries up; the germs pass into the air; they are breathed in by other men, who so get the disease started in them. In cattle the danger takes place in a different way.

HOW ARE CONSUMPTION GERMS, OR TUBERCLE BACILLI, SCATTERED BY ANIMALS?

The germs of consumption are often present in meat obtained from consumptive or tuberculous animals, but the most frequent way by which the germs of consumption from animals reach persons, is in milk, cream, and from ice cream, butter and cheese made from the milk of consumptive or tuberculous cows.

If milk were a transparent fluid like water, the enormous number of disease germs dairy milk usually contains would be clearly seen; that is, it would look cloudy. Disease germs, including the consumption germ, are easily killed by heat. *Raw milk is apt to be dangerous,* because it is apt to convey the consumption germs from animals to men who drink it.

We can make sure that the germs of this disease, Consumption or Tuberculosis, in milk are destroyed by simply scalding it or pasteurizing it.

PASTEURIZATION OF MILK.

Heating milk a short time just hot enough to kill the disease germs it may contain is known as pasteurizing it. Milk boils at about 212° Fahrenheit, or the temperature at which water boils. To kill the disease germs that are most commonly to be found in milk, it should be heated to 140° F. for twenty minutes or 150° F. for ten minutes. Pasteurized milk and also scalded milk should be cooled quickly and *should be kept cool and covered until it is used.*

LARGE NUMBER OF VICTIMS OF CONSUMPTION OR TUBERCULOSIS.

It is estimated that between 150,000 and 200,000 people die of Consumption in the United States every year, that is to say, *as many people die of Consumption every year as die from sickness and on the field of battle during our whole Civil War.* So that, unless the existing conditions are improved, eight millions of the people now living in our country are sure to die of Consumption. The disease affects the old and the young and is particularly deadly between the ages of 15 and 40 years, which is the period of greatest vigor and usefulness.

IT IS FURTHER ESTIMATED BY THE UNITED STATES GOVERNMENT THAT NEARLY A QUARTER OF THE DAIRY COWS FROM WHICH CITIES OBTAIN THEIR MILK SUPPLY ARE AFFECTED MORE OR LESS SERIOUSLY WITH CONSUMPTION.

Tuberculosis, or Consumption, causes greater losses by far and destroys more lives than any other disease.

WHAT IS THE CHARACTER OF CONSUMPTION OR TUBERCULOSIS?

Consumption is usually a slowly advancing disease in man, and it often is so in cattle, which may be in the body a long time before it causes a noticeable change from health. Later on it causes general weakening, perhaps cough, loss of flesh and other conditions by which it is easily recognized.

The concealed, slowly advancing nature of Consumption or Tuberculosis in animals often prevents the disease from being recognized in its earlier stages.

IF CONSUMPTION OR TUBERCULOSIS IN CATTLE IS SO CONCEALED AND SLOWLY ADVANCING IN ITS NATURE, HOW CAN IT BE DETECTED?

Robert Koch, who discovered the cause of Consumption to be the consumptive germ, also discovered a way to detect the presence of the disease in animals, even though those animals appeared to be in good health. This he showed could be done by using a liquid called tuberculin. During the last few years it has been found that, by the utmost care by veterinary experts who prepare the tuberculin to detect Consumption or Tuberculosis in cattle, and by great care in the process of using this agent, the disease can readily be discovered if an animal has become affected by it. This can be done by experts in the vast majority of cattle affected with the disease.

WITHOUT THE CONSUMPTION GERMS THERE CAN BE NO CONSUMPTION.

Consumption cannot develop in man, cattle or hogs, unless the consumption germ, or tubercle bacillus, enters the body! It is therefore of the greatest importance to see to it that by no manner of means these germs enter the body. Man can avoid getting the germs from animals by abstaining from eating the meat from consumptive animals, and by refusing to use dairy products from consumptive cows.

Many insanitary conditions favor the development of consumption, and often the consumptive germ is harmless without the aid of these conditions. It is therefore of the highest importance to know what these unhealthy conditions are.

HOW DO HOGS GET THE CONSUMPTION GERMS INTO THEIR BODIES?

Chiefly, by eating slaughter-house or other offal which is from animals which had consumption or tuberculosis when killed; by drinking milk from consumptive cows; by following tuberculous or consumptive cattle and nosing and eating droppings from such cattle. Or, they get diseased by eating anything containing the germs of consumption.

HOW DO CATTLE GET THE CONSUMPTION GERMS INTO THEIR BODIES?

The germs are thrown off by cattle in enormous numbers in the manure dropped by consumptive or tuberculous animals. Thus the fields, stable-yards, stables, litter become affected by the germs, and they easily get onto the food of healthy animals, or into the milk drunk by calves. This is the chief means by which the germs are passed to the healthy; though cattle may get the disease by breathing in the germs also, and calves by having the navel soiled by the germs, on the ground just after they are born.

IS CONSUMPTION OR TUBERCULOSIS PRESENT AMONG THE CATTLE AND HOGS OF OUR STATE OF ILLINOIS?

The disease, Consumption, is present to an alarming degree among our cattle and hogs. This is known by detection of the disease by State Veterinarians using tuberculin as an agent for the purpose. The disease is widely prevalent among cattle, particularly in the dairy regions. The disease is known to be very widespread among hogs, as shown in the increasing number of them which are being condemned and destroyed, because the disease is found in the carcasses, by U. S. Government and State Inspectors at such centers as Chicago, East St. Louis and elsewhere.

HOW IS IT THAT CONSUMPTION OR TUBERCULOSIS IS GETTING SUCH A HOLD ON OUR CATTLE AND HOGS?

It is because we are willing to allow all the states surrounding Illinois to dump their consumptive cattle into our State. The nearby states are strict about allowing consumptive cattle to cross their borders and be sold in their midst; but they send over to us all tuberculous cattle they don't want. This is a curse to our cattle interests; because these consumptive cattle bring the disease to our healthy ones.

The disease also spreads rapidly amongst our cattle because we foolishly permit cattle to be brought into our State, for feeding and breeding purposes, without requiring them to show a clean bill of health. In this way our cattle are always getting mixed up with cattle which are diseased, and so consumption spreads and spreads.

Hogs mostly get the consumption germ from cattle having the disease. The more tuberculosis there is amongst cattle the more there will be among hogs which eat the refuse from such cattle.

DO THE FARMERS, THEIR WIVES AND CHILDREN WANT TO EAT DISEASED MEAT?

Farmers, if they know it, will not eat meat taken from animals sick with consumption or tuberculosis; nor would they let their wives and little ones do so, if they once knew the danger. There are dozens and dozens of slaughter-houses throughout the State which are commonly in the filthiest possible condition. The State officials, from lack of funds and power, are unable to stop this. Very many of the poorest class of cattle and other animals may be slaughtered in these places and the meat sold along the country roads and in the villages, very likely from consumptive cattle or hogs. Experts should be on hand at slaughtering places to lay hold of tuberculous meat and stop its sale. Why should a farmer eat diseased meat any more than anybody else?

HINTS WORTH REMEMBERING.

Build your reputation for civic pride as a dairy farmer on a sound dairy herd.

A man who has suffered losses from tuberculosis hates the disease as a person burnt hates the fire.

Don't shut the door after the barn is burned; don't delay excluding consumptive cattle from the State until we have 100 per cent of the disease among our cattle.

The cry don't change horses in the middle of a stream, if applied to the livestock conditions, would mean let tuberculosis remain unchecked in its ravages.

Let well enough alone; let every state dump on us tuberculous cattle?

They say a man can get used to being hung. Do our farmers take pleasure in thoughts of eating meat laden with consumption germs?

Laugh and grow fat—if you are sure you are eating wholesome, healthy meat.

We are proud of our livestock State; why shouldn't we have exemplary livestock laws to be proud of?

State
Board of Live Stock Commissioners
OF ILLINOIS

Bulletin No. 4, September, 1911

COMMON DISEASES OF SHEEP

STATE HOUSE
SPRINGFIELD, ILLINOIS.

SPRINGFIELD
ILLINOIS STATE JOURNAL CO., STATE PRINTERS
1911.

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COMMON DISEASES OF SHEEP.

A. T. PETERS.

INFLAMMATION OF THE LUNGS (PNEUMONIA).

This is a very frequent occurrence among sheep, caused by low, wet pastures or from being out in a cold rain or storm such as sleet, or after they have been driven for many miles against a hard wind, or it may occur after shearing or dipping them, or washing them in bad weather. These conditions may also produce laryngitis. Inflammation of the lungs may also be caused by allowing animals to carry very heavy fleece and to be confined in a hot, badly ventilated stable,. causing congestion of the lungs.

Symptoms—Animals suffering from inflammation of the lungs are usually dull. They neglect food and cease to ruminate. They have a chill, which is always one of the first symptoms, but is usually not noticed by the herdsman, for it is of short duration. The eyes seem cloudy and there is a labored, quick breathing. When water is handy the animals drink very frequently. There is almost always a persistent hard cough. There is a fœtid discharge from the nose. The teeth are ground frequently. Weakness becomes very marked and at this stage the eyes are dull and have a bluish appearance.

Treatment—The treatment should be entirely preventive and should consist of the removal of the cause. First give the animals plenty of fresh air. Avoid drafts and make them generally comfortable. When medicines are administered they should be of the kind that will stimulate, for example, a strong tonic or a counterirritant, such as a strong liniment rubbed over the chest consisting of spirits of camphor. Also inject under the skin 5 cc. of oil of camphor. If the animal is strong, bleeding can be resorted to, but does not give very good success. Other remedies such as sulphate of quinine, tincture of iron, and whisky are indicated.

PLEURISY.

This is an inflammation of the coverings of the lungs and chest cavity. It is usually produced by exposure, more often after washing the sheep for scab or dipping them, or by keeping them in sheds that are improperly ventilated, or right after the exposure from shearing.

Symptoms—The symptoms resemble those of pneumonia very much. There is a cough, which is dry and hacking.

As in pneumonia, the treatment should be purely preventive and the exciting cause should be removed, and in the main the same treatment should be given as that recommended in the preceding chapter.

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IMPACTION OF THE RUMEN.

This may occur when sheep are changed from a poor pasture to a very rich one, where the rumen is filled with an excessive quantity of food, which becoming impact causes a complete or partial paralysis of that organ. When the walls of the rumen become paralyzed the natural motion ceases and the contents of the rumen become an inert and indigestible mass. This often occurs after a day or two of fasting.

Symptoms—This condition may exist for some time before being noticed. On making an examination of the region of the rumen, in many cases it may be seen to be slightly distended. Impaction must be distinguished from bloat, as in a case of impaction the pressure on the left flank reveals a kind of doughy condition and not a yielding tumor as is seen in bloat. If the rumen is very full the indentation caused by the pressure of the fingers may remain for some time. There is also a flow of saliva from the mouth. These symptoms reveal quite a serious condition, but by no means an uncommon one. The animals are dull. Rumination has ceased. They show some pain and are very often markedly distressed. They have an anxious look and sometimes show symptoms of colic.

Treatment—The following may be given as a drench:

Barbadoes aloes	½ ounce.
Fluid extract belladonna	½ dram.
Linseed oil	1 pint.

Epsom salt or powdered aloes or castor oil may be given. If the animal is valuable an incision into the rumen can be made by first clipping the fleece and then making an incision about 3 inches in length so as to admit the operator's hand. The writer would not advise this incision unless the animal is a very valuable one.

IMPACTION OF THE THIRD STOMACH (MANYPLIES).

This is very often found in connection with impaction of the rumen and is due to the same causes. It usually produces inflammation of the mucous membranes and retards nutrition. If impaction exists for any length of time the small leaves become paralyzed and this causes an inflammation and consequent irritation, and as a result of this inflammation impaction of the third stomach is a very serious disturbance in sheep.

Treatment—The same treatment as recommended for impaction of the rumen should be given.

WOOL BALLS.

Wool balls are found in the first stomach (rumen). They are found very frequently. As in calves, they do not produce very much trouble, except when they are found in large numbers; it is then that they cause death. In sheep there is more danger right after shearing, especially if the animal is infected with the mange mite. This parasite causes an irritation, and the biting and licking may cause an unusually large quantity of wool to be taken up and swallowed. This can only produce a severe inflammation of the bowels and finally cause death, therefore, the necessary preventive measures should be taken against this occurrence.

COLIC.

This does not occur very often in sheep, due, no doubt, to the thoroughness with which the sheep masticate their food. Spasmodic colic appears very suddenly. It may be caused by many things, as impaired digestion, bad food, fermented food, sudden changes from one food to another, or the drinking of very cold water, especially after being driven for many miles and somewhat overheated.

Symptoms—The symptoms are the grinding of the teeth, frequent getting up, great restlessness, and striking with the hind limbs against the abdomen. The pain may be constant or only periodical. The animals may cast themselves violently on the ground and roll. The pulse is usually very rapid. There may be a frequent but ineffectual attempt at urination.

Treatment—The treatment should consist of antispasmodic remedies, and counterirritants over the abdomen or over the loins, such as rubbing with spirits of camphor or ammonia liniment. Internally one can give such remedies as sulphuric ether, tincture of capsicum, ginger, and cannabis indica. It should be remembered that removing the cause is essential.

The following is a good formula:

Tincture of capsicum	1 dram.
Sulphuric ether	1 dram.
Water	4 ounces.

This is a dose for lambs about 4 months old. In addition to this, if there is constipation a rectal injection of soap water is always indicated.

CHOKING.

This does not occur so often in sheep as it does in cattle. However, it occurs when feeding mostly on roots. Usually the obstruction lodges in the gullet.

Symptoms—The symptoms are that they stop feeding, they look dull, there is a difficult breathing, the animals bloat very rapidly. Death occurs very quickly, due to the pressure of the greatly distended stomach on the diaphragm. This naturally diminishes the capacity of the chest cavity, thus preventing the free expansion of the lungs, and death is the result.

Treatment—This requires an operation usually. A flexible probang is required or some flexible tube that can be pushed down the œsophagus. Where bloating is considerable this should be relieved first and can be done by puncturing the rumen with a trocar. Where an operation is not advisable, small doses of linseed oil can be given per month, and with the aid of manipulation very often the obstruction can be moved so that it will pass down into the stomach. It has also been recommended to inject with a blackleg syringe small quantities of oil just above the obstruction and work the throat with the hand. When a probang is not at hand, care should be taken not to use anything that will break in trying to push down the obstruction.

INFLAMMATION OF THE UDDER—GARGET (MAMMITIS).

This disease does not occur so often in sheep as it does in cattle. It may be due to a number of causes or influences, first of which may be mentioned exposure to cold, such as severe drafts, or exposure to wet, cold rains, by which the udder receives a severe chill; second, bruises caused by the udder coming in contact with objects, such as barbed wire or underbrush, or by the young severely pulling the udder. It is said that the disease is more often seen in animals that are in high condition, or to occur where the ewe has only one lamb to suckle and which is unable to take all of the milk, thus causing an inflamed condition similar to that of milk fever in cattle. It is quite a dangerous condition, for the sequels of this disease are serious, very often leaving the udder permanently ruined and spoiling the animal for breeding purposes. It may also prove fatal, causing gangerene to set in, which may result in blood poisoning.

Symptoms—The animals is dull. The udder is highly swollen and is hot to the touch. The secretion of milk is retarded and the milk is usually streaked with blood and thick. In a light attack the ewes suffer very little, but if the udder becomes aggravated and enlarged they suffer very much and show that they are in distress, and the swelling almost always spreads to the other quarters. The swelling is usually of a tough, putty-like consistency. The animal stands listless. Rumination is entirely suspended and the pulse and breathing are fast, showing a septic infection. The visible membranes of the skin are usually inflamed and of a red color, and hot to the touch. This red color will turn to a purple in the latter stages. The animal loses flesh very rapidly and if relief is not soon given they usually die from blood poisoning. When a number of ewes contract this affection, then it is supposed that it is of a contagious nature. This disease terminates in death very much more rapidly in sheep than in cattle.

Treatment—First, the udder should be thoroughly milked and then massaged. Hot fomentations are indicated. In applying hot fomentations one should be careful that the udder does not become chilled after using them. An ointment made up of opium is also indicated. The ewes should be given internally a physic of Epsom salt of about 2 ounces or a tonic of Fowler's solution. If the inflammation has ceased and the udder is hard, green soap may be applied warm, not hot enough to blister, once or twice a day, with beneficial results.

DISEASES OF THE PENIS.

This trouble is not found as often in sheep as it is in cattle and hogs. We have, however, very often an inflammation of the prepuce. This may occur in the ram. It is due to an inflammation which secretes a fluid from the lining membrane. The dirt accumulates and causes a severe inflammation.

Symptoms—The symptoms are that it becomes greatly swollen, is sensitive and hot to the touch. This produces difficult urination. Any pressure on the affected part causes a severe pain. It has a very offensive and disagreeable odor. If it is of any standing it will be of a cheesy, purulent character.

Treatment—Place the animal on its back and have the attendant hold it as quietly as possible. First, the exterior of the prepuce should be thoroughly washed and cleaned with lukewarm water and soap. The inside of the pouch should be washed with a weak solution of carbolic acid or kreso. If it is not possible to remove the accumulated material in this way, a free incision must be made on either side of the pouch and all the material carefully removed and thoroughly washed with a good antiseptic solution.

PARTURITION.

Ewes usually give birth to lambs in the spring. It is not uncommon that sheep give birth to twins. Usually they may be born one right after the other, but sometimes a period of a day or more elapses before the delivery of the second takes place. It is of importance that the ewes be kept as quiet as possible during the period of gestation, avoiding any influence that would annoy the animal or cause great excitement, which would be liable to produce a premature birth. Difficult parturition may arise from a number of causes: (1) From general debility, owing probably to a lack of feed or from becoming very poor by being affected with mange; (2) Excessive cold weather during the time of gestation; (3) Rupture of the water bag (envelopes), this causing the uterus to become exhausted, for the neck of the womb has not been sufficiency expanded—resulting almost invariably in severe parturition; (4) Injuries of various kinds, causing a premature birth and consequent difficult parturition; (5) Abnormal growths in the genital passage, which cause obstruction to the neck of the womb or vagina; (6) Injuries to the neck of the womb, such as laceration, which forms a tense cicatrix; (7) Another cause is the twisting of the uterus. Whenever the cause is due to debility, this of course is in most cases due to carelessness on the part of the owner, and in most instances can be prevented. Whenever it is due to tumors or to a deranged uterus, then surgical interference must be resorted to. Wherever the envelopes have broken prematurely and allowed the fluid to escape, lukewarm injections should be given freely so as to assist in the expulsion of the young. Wherever the os is unusually rigid, a douche of lukewarm water can be used or an ointment consisting of belladonna, opium, or echinacea. Sometimes the os cannot be dilated; it must in such cases be opened with a knife. However, a great many times difficult parturition occurs where ewes heavy in lamb have been chased around by dogs. It is not well to be overanxious to interfere with parturition; always let nature have its way until it becomes evident that one should interfere. If the ewe is very weak and prostrated a hypodermic injection of camphor oil under the skin on the side of the neck is beneficial. There are many presentations of the lamb which make it impossible to save it, and all operative interferences in these cases are very serious and should only be performed by skillful operators. For a great many animals operated on succumb from exhaustion, and for this reason it is not advisable to perform operations unless the ewe is very valuable. It is important that the animals should be kept in comfortable quarters during the period of gestation and not allowed to become excited, and when these wants are looked after and the ewe is given plenty of laxative food prior to parturition, there is very little trouble.

PARTURITION FEVER IN EWES.

This is a trouble that occurs quite frequently. The symptoms in ewes are somewhat different from those in cattle. It produces more of an erysipelous form of the udder and seems to occur in those ewes that have somewhat difficult parturition and that are in very good condition. The symptoms are usually very severe. There may be a high fever and constipation alternating with diarrhœa. It also occurs in ewes that have an abundance of milk. The cause of the disease seems to be somewhat of a septic infection. The udder is usually much swollen, very much reddened, and inflamed. The animal shows colic pains, is very restless, gets up and lies down, drawing the head to the side and kicking with the hind limbs at the flank, and there is grinding of the teeth. Occasionally there is an offensive discharge from the vagina. The eyes have a dark blue hue. The respiration is labored. The disease usually terminates rapidly and in the latter stages there is delirium, which finally results in paralysis and coma.

Treatment—The treatment should consist largely in prevention, feeding the animals before parturition upon laxative food and keeping their bowels in good condition. When the animal is not in a comatose stage a drench may be given consisting of Epsom salt or of oil. The udder should be milked out, the inflammation relieved by a 5 per cent ointment of carbolized vaseline—or a wash consisting of a 5 per cent solution of carbolic acid is very beneficial to the inflamed udder. After the udder is milked out thoroughly, an injection of air may be administered by inserting a milk tube to which a bicycle pump is attached and pumping the udder full of air. The vagina should be thoroughly disinfected with a 5 per cent solution of permanganate of potash. It should be thoroughly irrigated at least once a day until no more discharge comes with the solution, so as to avoid further septic intoxication. The animal should be fed nourishing food, for it will need to be strengthened. A good tonic, as quinine, tincture of iron, nux vomica, or Fowler's solution, can be used as a stimulant.

RETENTION OF AFTERBIRTH.

This may occur after difficult paturition. The placenta should not be allowed to remain longer than twenty-four hours. After twenty-four hours it is very apt to cause septic poisoning and produce the disease described in the previous chapter, for it decomposes and discharges a very offensive, reddish-yellow fluid. Its presence within the uterus is usually indicated by a portion of it hanging from the vulva. This gives rise also to inflammation and irritation, causing a general uneasiness. When this condition exists it is well to wash first the exterior, then carefully taking hold of the protruding part and pulling it gently. This is usually all that is required. It comes away quite readily. After it has been removed it is well to inject the vagina with a weak solution of permanganate of potash so as to avoid danger of a septic infection in the vagina. A slight physic may also be administered so as to keep the bowels loose and prevent any irritation.

INVERSION OF THE WOMB.

This usually occurs after a severe parturition. It may be a partial or a complete inversion, caused by violent straining and expulsive efforts on the part of the animal. Where the condition has not existed for any length of time, it can be treated with very little trouble. The first step to take is to wash all protruding parts with a weak solution of permanganate of potash. This solution should be warm. In replacing the inverted uterus the closed hand should be placed beneath the mass and should gradually push it back into position by turning and placing it and pushing the parts inward, turning it back into itself. When gangrene has set in, the parts may be scarified and thoroughly cleaned, but as a rule decomposition has then gone so far that amputation of the uterus is necessary to save the ewe's life. This may be done in the following manner: Sew the neck of the organ with thread, tying it tightly. Double thread should be used so that the thread will be brought around the entire neck of the organ and tied tightly to prevent circulation. When one is sure that the entire organ has been thoroughly and effectually sewed and tied, then one may severe the parts this side of the thread. When the parts are allowed to return back, the hind parts of the animal should be elevated. In ordinary cases it may be necessary to take a few stitches through the lips of the vulva, two on each side, to hold the womb in place. These stitches may remain from twenty-four to thirty-six hours, or one may put on a truss, but trusses, as a rule, do not give satisfactory results.

ABORTION.

This is a premature expulsion of the fœtus. It may be either of a non-infectious or of an infectious nature. Whenever a fœtus is dropped from twenty to thirty days previous to its proper time, this is considered an abortion. Abortion may occur where sheep have been roughly handled or hooked by a cow or kicked in the pasture by a colt or excited by a dog. When animals are fed injudiciously, as for example by giving a severe laxative, this may bring on abortion, or where they slip on the ice, or from fear, or if a ram is running a pregnant ewe, starvation—all these may cause abortion. But there is one kind of abortion that is caused by infection due to a specific germ that enters into the vagina and causes the premature expulsion of the young. These two diseases are now treated entirely separately. The first-named can be handled by introducing the proper preventive measures. The second one, due to infection, is far more difficult to cope with—it is the kind where the female becomes infected with the germs. It has been stated that cows can be contaminated by the male. The same causes are attributed to infectious abortion in ewes.

Symptoms—The symptoms are, first, a drowsiness; the ewe may also become restless, refuse food and cease to ruminate. In the nervous stage the animal bleats continually. These symptoms are usually overlooked by the average herdsman and not until these symptoms have become very much aggravated and labor pains present themselves does the shepherd become aware that anything is wrong, and within five to fourteen hours after the first symptoms have appeared the ewes have aborted. In a herd where a large per cent of the ewes drop their lambs prematurely, infectious abortion is to be strongly suspected. In flocks where ewes abort, this disease increases very much in virulence, so that it may appear without any warning to the shepherd, not giving any of the symptoms described at all. It has also been noticed by flock masters that where abortion occurs in flocks, it is followed by a number of cases of inverted wombs, and from this cause gangrene sets in, and when the womb becomes infected there is quite a loss among the ewes.

Treatment—The treatment should consist in removing the cause and should be purely preventive. Next, curative measures should be adopted. If for any reason it should occur through accident, either from having a vicious dog or allowing rams to run with the pregnant ewes, or by having the animals in a very debilitated state, this should be remedied at once. If, on the other hand, it is due to infection carried by the ram, then vigorous efforts should be instituted. First of all, wherever ewes abort, the fœtus should be burnt. This is of great importance. Where it cannot be burnt it should be buried deep with all the fœtal membranes. Wherever ewes have met with an accident, as by hooking or by being chased by a dog, and brought into an excited state, they should be placed in an inclosure and a teaspoonful of black haw given every three or four hours. Where the fœtal membranes have not come away from the ewes that have aborted they should be removed and the vagina thoroughly irrigated with permanganate of potash. Wherever it is possible in small flocks and the ewes are valuable they should be treated before breeding so that they are absolutely clean. This is of great importance. Similar treatment should be given to the ram. In fact, the same treatment should be given a flock where infectious abortion exists as that given for abortion in cows.

HÆMATURIA OF SHEEP (RED WATER).

This disease is a frequent occurrence in lambs that are still sucking and just ready to be weaned. Often it occurs in sheep. The cause of this disease seems to be faulty hygienic conditions, due largely to food that is contaminated. Some flock masters attribute it to feeding roots, especially those that contain molds. Others claim that the pastures that are swampy are the cause of it. Still others claim that it is exclusively due to food that has excessive water. This disease has not spread over a large territory so far. But wherever it appears it seems to cause severe losses. The sheep is not the only animal that is affected with this disease. Almost all herbivorous animals are more or less subject to it. Some flock masters attribute it to heavy dews, saying that when the pastures are subject to heavy dews there is more danger from this disease. Williams and Babes have found parasites in the blood of diseased animals. Others claim that it is due to overfeeding. Jaundice, however, may be due to other causes than bad food—it may be due to gall stones or abscesses, which may hinder the flow of bile to the intestines. Rich pastures which are infested with a large number of parasites, such as liver flukes, may be another source of jaundice, or it may be due to poisonous weeds.

Symptoms—The symptoms of red water and jaundice are about the same, the only difference being that in one we have the urine red and in the other we have the skin and meat of a yellowish, saffron color. The symptoms are that the animal is dull, there is a refusal of food, rumination ceases, the animal seems constipated; or the disease may have the opposite effect and there may be profuse diarrhœa, and there may be a swelling under the jaw. In either class of symptoms the abdomen is swollen, not the same as in bloat, but the muscles of the abdomen feel doughy to the touch. The animal may die suddenly, as in apoplexy, or there may be a symptom of giddiness, similar to that of thumps in hogs. The animal becomes unconscious and death follows.

Post-mortem Appearances—In jaundice we find that the tissues of the body are of a saffron color, the fat is of a lemon color and has a peculiar odor like garlic. There is usually a dropsical condition in the abdomen, in the form of a red, water fluid. The membrane is usually bloodless. The liver is usually very much enlarged and has a brownish appearance as though it had been boiled.

Treatment—The treatment recommended by all writers is that of a change of diet and the removal of the animals from the pasture in which they die. Usually a change of food prevents further spread of this disease. So far none of the men who have observed the disease have been able to cure it when the animal has once become affected, claiming that medicinal treatment has always failed.

FOOT ROT.

This is a disease that may be caused by foreign substances or it may be of an infectious nature. A foreign substance may enter the foot and if not noticed may cause a severe disturbance. Foot rot from this cause is more often found on marshy, wet grounds where filth and decomposed grass and other substances may lodge between the claws and cause irritation and consequent inflammation of the feet. The disease may be, as stated, of an infectious nature and spread from one animal to another through the bedding or litter or in the feed lot. This contagious foot rot has not been met with for a certainty in this country. However, foot rot as seen in this country may cause a severe loss, not because it is necessarily fatal to the animal, but on account of the irritation, fever and worry, since the animals lose flesh and are a severe loss to the owner, for they take up and consume feed that is not giving any returns.

Symptoms—The first one noticed is a tenderness of the foot; the animal walks as though they were sore. At first there may be only one foot involved and later others. In the first stages the animal may be only slightly lame, and in the later stages he may be so sore that he will crawl on his knees. On close examination of the foot one will notice a moist substance right over the horny part of the foot. This may be either in the front or heel or the cleft of the foot. It is warm and very sensitive to the touch and has a very disagreeable odor. One can detect this disease among a flock simply by the characteristic odor, when he is familiar with it. There may also be a loosening of the horny tissue and under this horny tissue may be found a great quantity of pus.

Treatment—In small flocks it is possible to treat the animals separately. In larger flocks this is not done so readily. First, all the litter and rubbish should be cleaned up in the pens and feed lots. Then the affected parts may be washed with a kreso solution or a solution of permanganate of potash. When thoroughly washed an ointment made up of iodoform and pine-tar may be applied. But the best results may be obtained by painting the parts liberally with green soap. Applying this green soap to the affected parts has given rapid recovery.

WHITE SCOURS.

This is an exceedingly fatal disease in sheep. It is known to be due to a specific organism which enters through the navel. Before the true character of this disease was known many thousands of newborn animals died from it. But careful investigations have been made showing that the disease is not due to overfeeding, as was supposed, but to infection through the navel, and since that time this disease has been reduced where proper care has been taken. It is more often seen where proper hygienic conditions are wanting, where the animals are overcrowded and placed in damp, dirty quarters. This is where the umbilicus becomes infected.

Symptoms—One of the first symptoms noticed is great depression. The animal does not suck, bleats continually. Constipation may be one of the first symptoms, followed by a sulphur-colored discharge which is very offensive. The animal may show colic symptoms, throwing its head against the abdomen and continually switching the tail. The tail becomes contaminated with the fecal matter and the animal presents the symptoms of having severe diarrhœa. Sometimes there is a slight fermentation of the bowel, which may cause bloating. On account of the switching of the tail the animal becomes soiled with the discharge around the thighs, rump, abdomen and legs. The lamb usually does not care for milk and will not suck. The respiration is deep and labored and the animal manifests symptoms of continued pain. Following these symptoms the animal usually dies from exhaustion.

Treatment—The treatment should be entirely preventive. The first thing to do is to clean up the pens and thoroughly disinfect them with slacked lime and a liberal coat of whitewash. The affected animals should be kept in one place so that they will not contaminate the entire premises. As a further preventive the umbilicus of all newborn lambs should be washed with a 5 per cent solution of carbolic acid. After the hemorrhage has ceased, the navel cord may be tied, and as a further precaution against infection, especially on badly infected premises, it can be seared with a hot iron so as to prevent the germs from entering. Diseased animals can be given a laxative, such as castor oil, and an injection of soapsuds. The umbilicus should be washed thoroughly and disinfected with a 5 per cent solution of permanganate of potash or a 5 per cent solution of carbolic acid. There is not much hope for them to recover. Most of them die.

LOUPING-ILL.

This is an infectious disease caused by ticks. It has not been seen in this country. It has been confined practically to England. This disease is caused by ticks and seems to be produced the same as Texas fever in cattle. Dr. Williams of England experimented by placing animals that were free from ticks on tick infested soil and produced the disease. He also sent ticks to counties that were free from this disease and placed them on healthy sheep that were free from ticks and in a short time produced the disease in them, showing conclusively that it is the tick that produces the disease, just as the tick produces Texas fever in cattle. A number of other experiments were conducted to show that it was exclusively due to the tick. The tick produces a dark swelling and in these swellings a micro-organism is found, and if sheep are inoculated with this organism it will produce the disease.

Symptoms—After a sheep is infested with ticks it takes from eight to ten days before the characteristic symptoms appear. They are known as trembling or louping-ill. These names indicate that the disease is of a spasmodic kind, similar to that of rheumatism or cramps of the muscles. The animal is very much excited, easily frightened, and is hard to, catch, and when caught struggles violently and has the characteristic trembles, which may be followed by a clonic spasm in which the animal may become unconscious and at which time there is a jerking of the hind limbs. At other times animals may be seen walking with a jerky gait resembling that of stringhalt in horses, the pupil of the eye is dilated and the expression is that of intense excitement. It may jump over imaginary objects. It is exceedingly restless, getting up and lying down again. In some cases there may be entire paralysis of the muscles of the back and loins.

Treatment—There is no known treatment for this disease. Prevention should be practiced by ridding the infected area of the ticks that cause this disease. Mild cases are said to recover but severe cases usually die.

INFLAMMATION OF THE TESTICLE.

In most cases this is due to some injury, such as being caught on barbed wire fences, or to excessive service, producing growths on the gland tissue. On the range it is not uncommon to find injuries to this organ in severe cold weather.

Symptoms—The symptoms are that the organ is swollen, hot to the touch, red, and highly inflamed. The animal moves about with a very stiff gait, as though it had been injured in the back. Upon examination a swelling will be found. The animal is usually seen standing by itself and does not move with the rest of the flock. The flock master will notice that something is wrong and upon examination he will find that the gland and scrotum are very much swollen.

Treatment—The treatment should consist, first, in hot fomentations, and if the gland is swollen very much a bandage should be put over the body so as to relieve the weight of the testicle. Very often this measure will aid greatly in reducing the inflammation. A good ointment for this trouble is 5 parts of ichthyol to 50 parts of vaseline. This rubbed in well will usually give good results if it is not of long standing.

CASTRATION.

Castration of lambs is usually done when they are from 2 to 6 weeks old. Lambs when they are strong and healthy may be operated on almost any time say within a week from birth; some operate earlier than that. It is not advisable to allow them to become too old. They should not be more than a month or 5 weeks old. After they are 2 months old there is considerable danger, especially from infection. The hair has by this time become long and harbors a great many germs, especially the tetanus germ, which produces lockjaw, and no matter how carefully the operation has been performed infection seems to take place, causing death in numerous cases and thus considerable loss to the owner. Another argument for early castration is that the nerve supply to the generative organs is not so great in the early stage as later on, and for this reason is not nearly so painful when performed on young animals. When the operation is to be performed the lamb can be laid on a table, which has been previously scoured with an antiseptic solution, carbolic acid being preferable; or a board that is perfectly clean may be used and the animal set on its rump. The first thing to do after the animal is either cast on the table or set up in the rump position is to make an examination for scrotal hernia. When this is not present, and it is found that the animal is perfectly healthy and in normal condition, the operator draws up with the fingers and thumb of the left hand the lower end of the scrotum, commonly called the bag, and makes a clean cut across it, severing it entirely, and the testicle is drawn with the fore finger and thumb of the left hand until the spermatic cord is ruptured. At times it may be necessary to scrape the cord, drawing it out until it resembles a fine string, and scraping it with a knife. When performing the operation in this way there is hardly any bleeding, whereas when you cut across the cord there would be quite a hemorrhage.

Treatment—The treatment should be entirely antiseptic, using carbolic acid water as a wash and thoroughly smearing a carbolic acid salve over the sac. Recently some flock masters in castrating take the scrotum bag and testicle together, with a hot iron, and they claim that since they have been performing the operation with a hot iron they are not losing any animals from infection. It is simpler and I think quite as humane. After castration the animals can be put on pastures. Unless the sheep pens or houses are thoroughly clean there is great danger of contamination, and it seems to be better to allow them to run about. They do much better when put on pasture than when kept confined.

All instruments used should first be placed in boiling water for fifteen minutes and then placed in a clean dish or bucket of water, to which has been added an antiseptic, which may be any of the coal-tar dips; in fact, any antiseptic except bichloride of mercury, which will corrode the instruments.

POISONOUS WEEDS.

In recent years there have been a great many investigations made in the western states, especially where there is an abundance of grazing, to ascertain the poison in certain weeds that are especially poisonous to animals. On account of the sheep being pastured to a great extent, there is always a heavy loss in the western states, due to some poisonous weeds. The exact figures of the annual loss cannot be given, but they are very large. The knowledge that we have concerning the poisonous properties of our native plants has been mostly derived from European investigators. Within recent years the Department of Agriculture at Washington has made strenuous efforts to reduce the severe losses produced annually from this source, and already valuable results have been obtained from their investigations. In connection with this a number of experiment stations located in the states where these losses occur have also given valuable assistance. A number of bulletins have recently appeared on some of the poisonous plants that are injurious to live stock. Poisonous plants may grow in any locality and under various conditions. They exist in highly cultivated fields, in localities where there is very little moisture and are found in practically all elevations. What the people usually consider a poisonous plant is one that always produces the same fatal results when fed or accidentally eaten by an animal. This popular theory is not, however, correct. Plants may be poisonous at one time, due to climatic conditions, and not at another. This is plainly seen in the sorghum plant. This plant is deadly poison when stunted in its growth and not at all so when it has matured properly. Again, even if the plant is stunted in its growth and highly poisonous, it can be fed without any ill effects to stock when allowed to dry in the air for twenty-four to forty-eight hours. Furthermore, the entire plant may not be poisonous but only parts of it; for instance, only the roots may be poisonous. This is shown clearly in the potato. For example, if the potato tuber is exposed to the sunlight during its growth the skin becomes green, and during this process a poison is formed. Then, again, the amount of the poisonous plants eaten must be taken into consideration. Furthermore, we find that some non-poisonous plants have the power of causing fermentation, for instance, the clover and alfalfa. Again, plants like ergot produce a very slow poison in the system, known as ergotism, which is an intoxication. However, the plant that seems to be one of the most harmful to sheep is the loco weed.

LOCO WEED.

There are two varieties of loco weed that require consideration—the first, *Astragalus molissimus*, and the second, *Astragalus lambertii*. We will take up what is known as the crazy weed (*Astragalus lambertii*). This weed is found more often in our western states than the other and seems to be the one more often found where sheep are what is commonly known as "locoed." It is stated that in some parts of Montana, where sheep are grazed extensively and where the loco weed exists, there are times when 50 per cent of the lambs become affected by eating the weed. This weed may be found at almost any elevation. It has been found high up in the mountains and it can be seen on the plains as a white, erect, not very branching weed. The leaves are narrow and not so hairy as the wooly loco. It has a one-cell pod. The white flowers are not so numerous on the spike and are frequently of a nearly white color. This weed is not evenly distributed, as one would suppose, over a large area, but is found irregularly. Some of the old pioneers in the western states claim that this irregular distribution is due to its being carried by buffaloes. The buffaloes wallowing around, rolling in the sand and dirt, the pod seeds adhered to the hair and are carried many miles in that way. They say that it is not uncommon to find this loco weed present to a large extent in the buffalo wallows. However, regardless of how much the buffaloes had to do with the distribution of this weed, it is found farther east and north to a great extent. The loco weed is, as stated, usually found in clusters. It is quite a conspicuous plant and can be seen by animals for a long distance. It appears in the early spring, especially when other vegetation is scarce. This plant remains green for a long time and on this account the animals are induced to feed on it. Horses and sheep are the animals that are most frequently affected by the loco weed. Cattle may acquire the habit, but it is not very often seen in them. On the ranges of Montana and Oregon, farther west, horses have acquired the habit to a large extent. Next to sheep the loss in horses is the most extensive. Drs. Wilcox and Chestnut say that where sheep have not acquired the habit they will eat up all kinds of weeds before they will touch the loco weed, even where they are starved to do so. This shows that this is not a weed that naturally attracts them to feed on, but that they must in some way or another acquire the habit of browsing or feeding on it and then it becomes hard for them to resist the habit. "Observations have been made

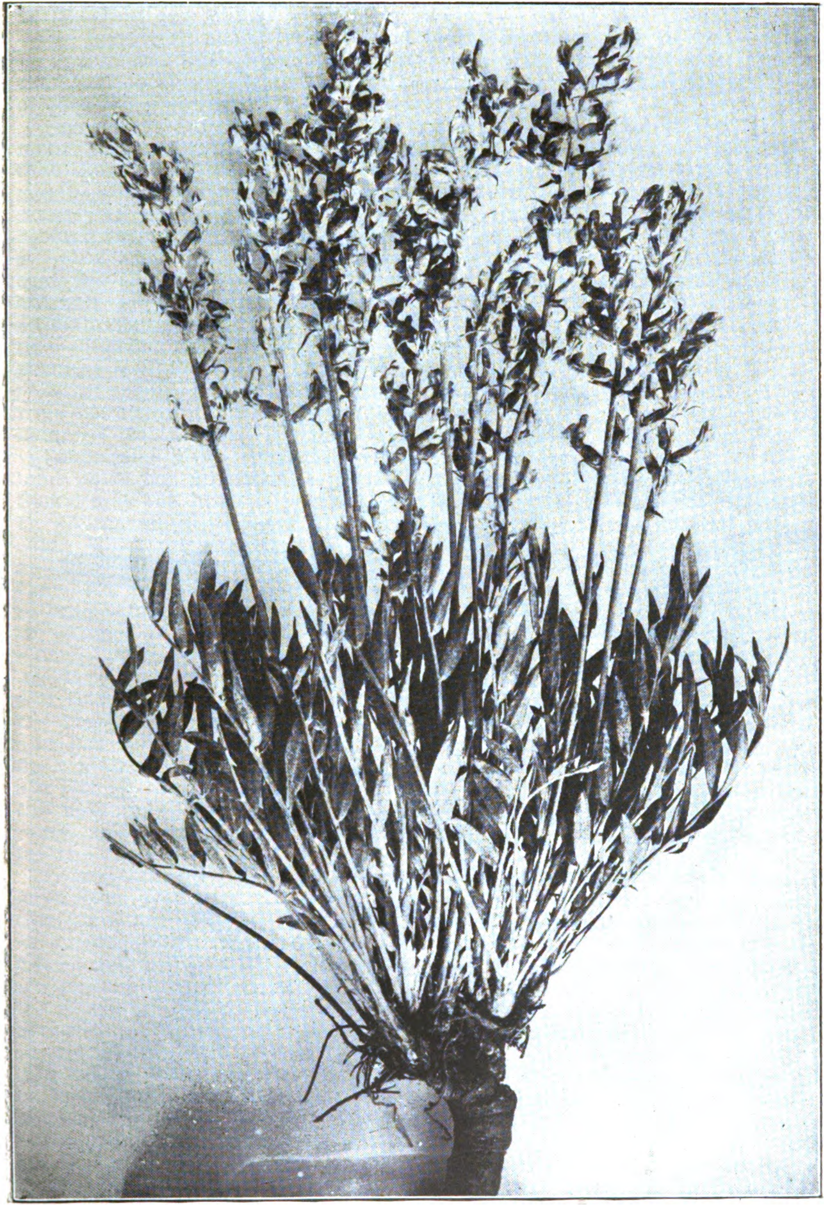

Plate 1.

White loco, or rattle weed (Aragallus lamberti.) Plant in flowers.

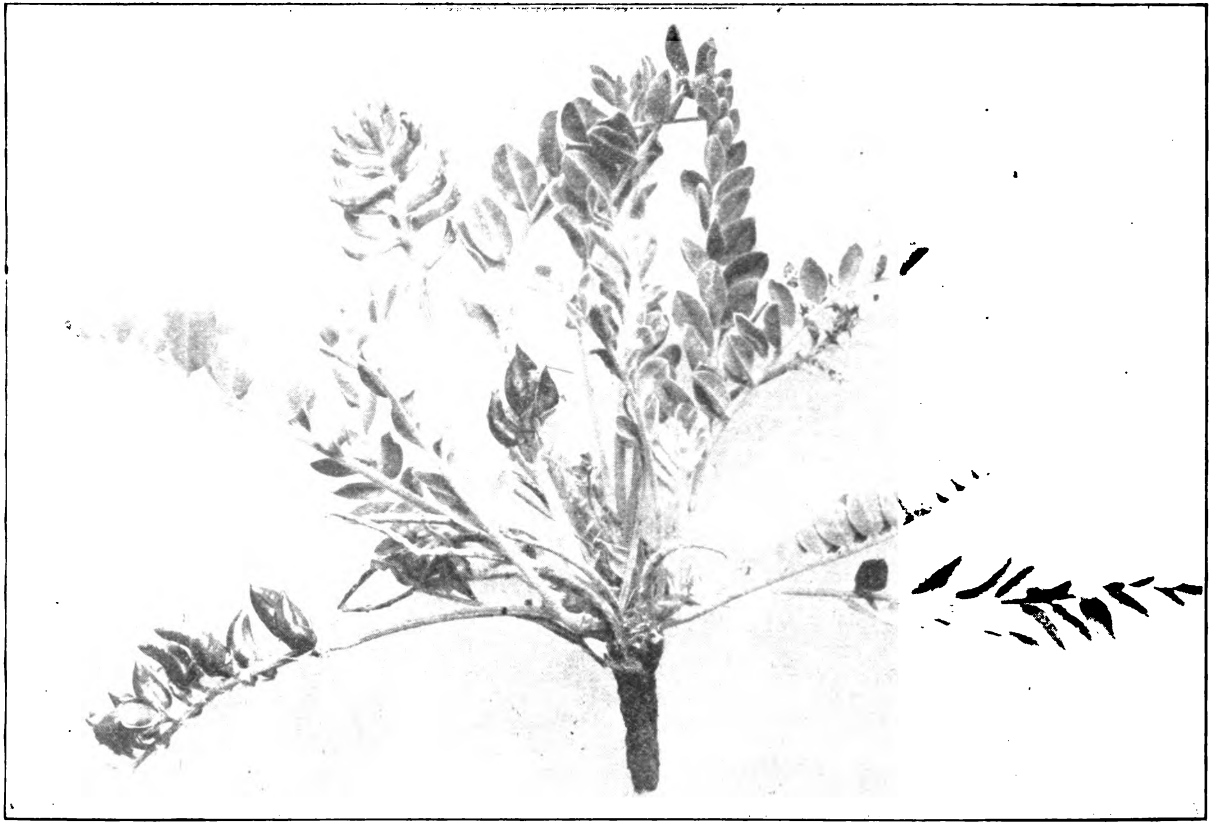

Plate II.
Purple, or wooly loco (Astragalus mollessimus.) **Showing both flower and fruit.**

by Chestnut and Wilcox where they saw a ewe eating large quantities of the white loco weed about 10:00 o'clock in the morning, and in the evening at 7:00 the ewe was unmanageable and her little lamb was sick, and upon examination the characteristic symptoms that are always observed in cases of loco were present."

Symptoms—They are characteristic and are usually familiar to all herdsmen. Loco disease is a slow poisoning. It is said of the sheep affected that they are crazy or "locoed" (loco in Spanish signifying insane). It primarily affects the nervous system and impairs the function of the organs of sense. In almost all cases the sight is impaired, the animals seem blind, become stupid and wander around, leave the herd, have an optical illusion, stepping high, eyes always of glassy, bluish appearance and herdsmen claim that the front teeth grow very long and that the teeth become loose. The animals appear unthrifty. The hair is loose and becomes shaggy. The animals become easily frightened and are unmanageable. This period is termed crazy. The site usually becomes so impaired that they make very peculiar movements, not having a correct idea of the distance or objects in front of them. It also affects their hearing—they seem to be deaf. The nervous condition of the animals depends entirely upon the stage of development of the disease. At times the slightest noise will set them into convulsions and make them become very excited, whereas at other stages a loud noise has no effect on them. They have no control of their muscles. Sometimes the head is carried very erect and at other times to one side. In almost all cases there is a trembling, as though the animal were very cold. This trembling is sometimes confined to the muscles of the abdomen and at other times affect the entire carcass and including the limbs. Sheep that are "locoed" are exceedingly troublesome to the herder; they are hard to take care of, the difficulty arising in this, that the sheep so affected start in various directions at the least provocation. The characteristic shedding and lengthening of the teeth, which was described above and is seen in nearly every instance, is natural, as they would shed their teeth any way, and is not attributable to the plant. In the advance stages of this disease the sheep nearly always becomes very much emaciated, very thin in flesh, and has severe attacks of delirium, in which they are called crazy by the flock master. It is said that few of the sheep that acquired the habit and are left on the range will recover from this disease, for the reason that if the habit is acquired they will eat nothing but this weed, even eating the roots, and it has been noticed that sheep badly affected will paw and dig for the roots.

Treatment—An attempt to cure is a hopeless task. Preventive measures have been employed. It has been found that older animals will not eat this plant and that the young stock learned to eat it on account of its being very constrictive in the early months of May and June. Having a white flower and being quite an attractive plant, it attracts the young stock that are just learning to graze, and when they have become accustomed to eating the flowers it has the same effect that opium or morphine has on the human being, and they cannot resist, for the loco plant acts as a narcotic and presumably produces a pleasing sensation to the animals that feed on it. That this theory is true is claimed by a number of ranchmen who have pastured in localities where there has been a heavy loss of young lambs from this disease, but where the pasturing of the older lambs on this ground was done without any loss. Others claim that where a preventive is fed, such as liberal quantities of salt and sulphur, the animal will not contract the habit. Now if the theory is true that the loco habit is formed when the lambs are learning to graze, then it is thought that the stockmen have an easy way to prevent this disease, and that by all means these lambs should not be pastured during the months of May, June and July in localities where the loco weed exists. As stated above, a cure for the ones already affected has not been found, so it would seem that the only solution would be prevention. It

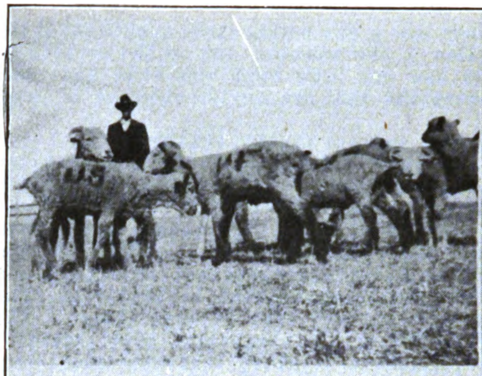

FIG. 1.

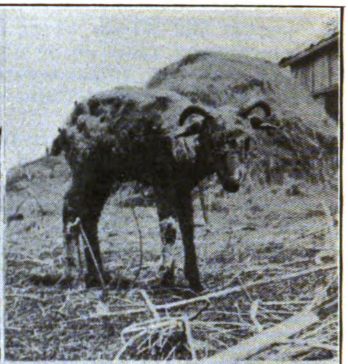

FIG. 2.

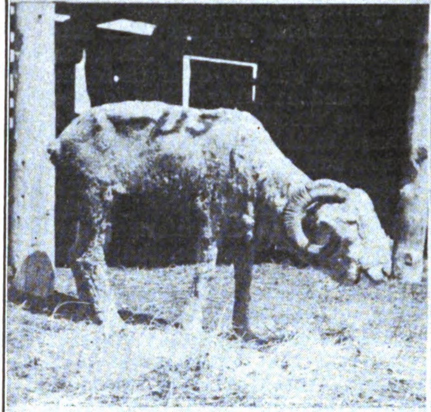

FIG. 3.

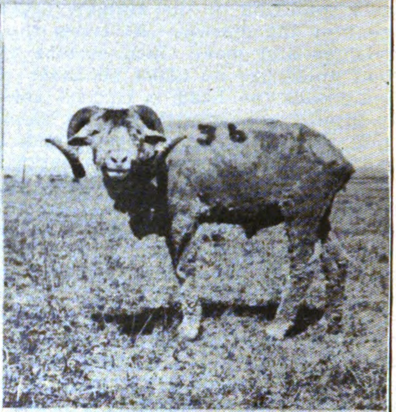

FIG. 4.

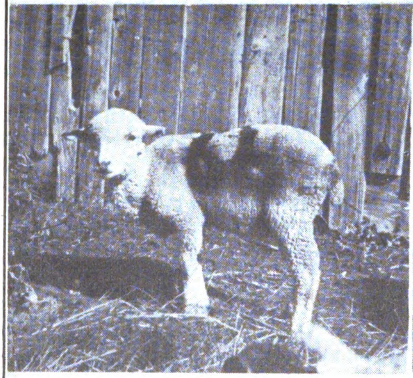

FIG. 5.

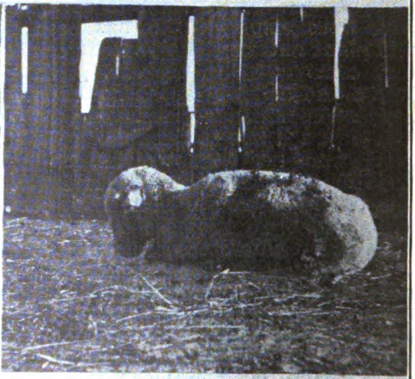

FIG. 6.

Plate III.

would appear that on account of the loco weed being always confined to patches these patches could be exterminated by some weed exterminator, especially by dropping a few drops of gasoline on the weed, or the powder of sulphate of iron. We know that a few drops of gasoline dropped in the center of the plant will destroy the plant clear to the roots and prevent it from coming up the next year. It seems that if the range be a valuable one some effort should be expended in killing the plant, either by the use of the iron or gasoline, which would not be injurious to the stock.

LUPINE.

There are at least four of the lupines that are poisonous. It seems from the evidence collected by those who have given this weed close attention that there cannot be a doubt but that the lupines are at some time dangerous. "Four of the native species have been found poisonous, *Lupinus cyaneus* Rydb., *L. leucophyllus* Dougl., *L. sericeus* Pursh and *L. pseudoparviflorus* Rydb., and it is probable that all are more or less so. These lupines all have blue, pea-like flowers and bean-like pods, whence the name 'prairie pea,' 'prairie bean,' 'blue bean,' etc. The roots are perennial and often somewhat creeping beneath the ground; the stems are two or three feet high with six or eight narrow leaflets arising from a single point in the leafstalk. The more dangerous species of the Upper Yellowstone *(L. cyaneus)* grows in dense clumps from a single thick root, often thickly scattered over considerable areas, and appears to be spreading rapidly. *L. cyaneus* is found in valleys and along streams and its distribution is almost identical with the so-called 'loco zone,' fruiting about July 1. The lupines are more abundant in the foothills east of the Divide, but are said to have caused losses in the Deer Lodge Valley and in the vicinity of Elliston, and the species occur throughout the whole mountainous section of the state. The principal species mentioned bloom early in June and are in fruit some three weeks later. Sheep are the main sufferers, although horses appear to be occasionally affected." *

These plants belong to the pea family and are easily distinguished from the loco weed and other wild flowers of this family by the character of the leaves. The leaves are compound and the several parts are attached to the leafstalk, radiating from this point in different directions.

Symptoms—This plant is very rapid in its action. It is said that when sheep feed on this plant, especially the pods, they die in a very short time, within an hour or two. The animal is said to become delirious and has fits of spasms. The violence and rapidity of the attack depends upon the quantity of the weed that the animal has eaten. The symptoms will vary with the quantity of the weed eaten. Some flock masters claim that where sheep are continually pastured on ranges where the lupine grows the danger is not so great, but that when they are not accustomed to the lupine and are brought on ranges where it is found, heavy losses occur. It seems as though

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*Montana Bulletin, No. 45, page 84.

DESCRIPTION OF PLATE III.

Fig. 1. A group of locoed animals, showing the general appearance of poisoned animals.

Fig. 2. Sheep 27. Shows a locoed sheep in the last stages of the poisoning.

Fig. 3. Sheep 36. Shows the effect of loco poisoning, combined with grub in the head, of an old ram.

Fig. 4. Showing the animal in a different attitude from that of Fig. 3.

Fig. 5. Case 66, October 20, 1906. A locoed lamb.

Fig. 6. Case 66, November 12, 1906. Showing the attitude of the animal just before its death.

the animals either become immune against the plant or do not touch it. Others claim that the danger from loss is when they turn animals that are very hungry or very hot into fields that contain these plants. Some believe that heavy dews and severe rains are some of the causes. Flock masters in Montana maintain that sheep can graze on lupines under ordinary conditions, but that the continued rain or snow is apt to cause the animals to eat more of the lupines and thereby die from lupine poisoning. In the western states there has been recorded enormous losses where sheep were in transit and were unloaded to graze in fields that contained large amounts of lupines in bloom. These losses are always very severe. The animals become apparently blind, semi-unconscious, have a staggering gait, and walk with their fore legs apart. If any obstruction is in their path they will run right into it. It is characteristic of sheep so affected that they seem to bunch up; if they should be so unfortunate as to run up against a wall or fence a large number of them will bunch up and die in this condition. There is usually a frothing at the mouth. There is very little bloat and death usually occurs within a couple of hours to a day or two.

This disease should be treated entirely by preventive measures. Sheep that are not accustomed to graze in fields where lupines exist should not be pastured in such fields. Hungry sheep should especially not be pastured in fields where lupines are found, especially when they are in bloom or in fruit. The sheep should be kept away from them at that time.

WATER HEMLOCK (CICUTA MACULATA).

This is a very poisonous plant. It has a smooth, purple, spotted stem. It grows from 2 to 5 feet high and with three to ten fleshy, tapering roots, and with much divided leaves and at attractive cluster of small white flowers. This plant appears from May to July. It may be found along wet places, especially along river banks. It belongs to the parsley family and may be easily distinguished by its bundle of spindle-shaped roots, which may be from 2 to 4 inches in length. The roots of this plant have long been known to be a deadly poison and are said to have been used by the Indians for suicide. Chestnut and Wilcox report that in Montana, in 1900, 105 sheep were poisoned by water hemlock, of which 80 died. This shows a large per cent of deaths and proves that the foliage as well as the roots is poisonous. It seems that when the mature plant is dry it is less poisonous than when fresh and green. Chestnut and Wilcox observed in 1900 that 80 per cent of the stock that ate of the young plants, including the roots, died from the effects. They also found in their experiments that the plants less than 1½ feet high were poionous to rabbits. It is therefore dangerous to pasture animals of any kind where water hemlock exists, for this plant when taken up with the food will prove fatal.

WILD PARSNIP.

The wild parsnip is known as common garden parsnip. It is supposed to be poisonous. A number of people consider it so. Prof. Pammel believes it is harmless, although the experiments were not conclusive. The writer would be very careful not to feed stock a great quantity of hay that contains this weed, especially if it has any roots with it, for it is not to his mind definitely settled whether this weed may not be as poisonous as water hemlock and produce the same symptoms.

DEATH CAMAS.

This plant is also called wild onion, mystery grass, and has several other names. It is a smooth, single-stemmed, onion-like plant from ½ to 3 feet in height, with a narrow spike of yellowish-white flowers, blooming about June 1. This plant does not taste or smell like the onion. It matures its fruit early and dies down in July. In the early stages it looks like grass and in this period it is quite dangerous. Another reason why the plant should be considered dangerous is that it starts early in the spring; another, that it can be mistaken for grass by stock. This weed has its favorite seat in shallow or hollow places, especially where the seepage of the ground is very poor. The Department at Washington recently found in the top of this plant a poisonous substance. The bulb seems to be the most poisonous part of the plant, but we find that sheep are poisoned more from the tops, stems and leaves. It is said that if sheep are grazed on good, rich pasture at first, they can later graze in fields that contain the death camas without any bad results. It is claimed that poisoning usually occurs in sheep when they are turned in pastures containing this plant on an empty stomach. The damage to sheep and stock from death camas is very large. Many thousands of sheep have died in the western states from this trouble. It is known that death camas when eaten will prove fatal in almost every instance.

Symptoms—The symptoms are that the animals become stiff, show an awkward gait, seeming to walk as though on stilts. There is a jerking of the muscles with intervals of spasms, which result in muscular paralysis and soon afterwards in death. There is a hurried respiration. There is an anxious look on the face and the animals exhibit quite a little excitement.

Treatment—The popular remedy used in the West is bleeding the animal, either cutting into the tail or limb, causing the blood to flow freely. It is said that good results have been obtained when this has been done in the early stages of the disease. Like in the preceding chapters prevention should be practiced so that the animal shall not have access to these poisonous plants, and if the range is not too heavily infested with this plant, the remedy for the extermination of the loco weed should be adopted.

TALL LARKSPUR (DELPHINIUM GLAUCUM).

This weed is thought by a great many ranchmen to cause more losses than by any other weed. Through the efforts of Chestnut and Wilcox of the Montana Station a great deal has been learned regarding these plants. At least six varieties have been suspected of causing these heavy losses. We will consider only the dwarf larkspur and the tall larkspur. These are the most important varieties to be considered from a poison standpoint. The tall larkspur is found under conditions similar to those of the death camas. The tall larkspur is what is known as a prairie plant. It grows from 4 to 7 feet high from a perennial root. It has a smooth white coating which can easily be rubbed off. The flowers are of a pale blue, arranged in long, slender, terminal racemes, like the true aconite plant. These plants can be found at a very high elevation, 8,000 feet up in the mountains. The poison is found mainly in the roots. The fruit and foliage do not contain so much. When sheep are affected they show a stiff, irregular gait, stagger, and finally fall. There is an involuntary twitching of the muscles. When fed wet the sheep may become bloated.

Symptoms—The characteristic symptoms are, considerable gas in the paunch, some salivation, frothing at the mouth, vomiting, and continual regurgitations. The animal is very much excited and the pulse very much increased. The skin seems to be very sensitive to the touch. The breathing is very rapid and shallow. There are symptoms of cerebral disturbance.

Just before death the animal may have violent convulsions. Sheep are more often poisoned by the purple larkspur than other animals. The leaves and roots of this plant contain the poison, especially just before flowering.

Treatment—The treatment for this disease that we shall give is that recommended by Chestnut and Wilcox, as follows: "In cases of poisoning by plants, especially by death camas and the larkspur, a solution containing equal weights of permanganate of potash and sulphate of aluminum should be administered at once. For adult sheep, take, according to the weight of the animal, 5 to 10 grains of each of these compounds dissolved in water and give as a drench. The same dose should be given to hogs. Fifteen to 20 grains are required for horses and from 30 to 50 for cattle. These doses are for adults; for very young animals (from 2 to 4 months old) the dose should be made proportionately smaller. In making these solutions the water used should be sufficient for drenching purposes and may vary from a pint to a quart, or even more. The water should be pure well or spring water which is not too strongly alkaline; the chemicals should be very finely powdered to insure rapid and complete solution, and care should be taken that they are entirely dissolved before the solution is used. For emergency in case a large number of animals should be poisoned at the same time, five hundred or a thousand doses of the dry, finely powdered salts should be kept at hand for immediate use. There is little danger, even within the wide limits given in the last paragraphs, of administering an excessive dose of this antidote. In one case as much as 3 2-10 grains of each salt was given within one and one-half hours to a 2-pound rabbit without causing any ill effect. It is very necessary, however, to observe one precaution. All of the salt mixture given to the animal must be in solution. The solid particles, if swallowed, will stick to the walls of the throat or stomach and cause intense irritation and may kill the animal."

SMALL LUNGWORMS (STRONGYLUS RUFESCENS).

This is a small nematode threadworm. It is the smaller of the two varieties of worms affecting the lungs of sheep. It is found in the lungs and bronchi and causes inflammatory pneumonia. It differs from the large threadworm in that the small threadworm produces pneumonia while the other produces bronchitis, causing a weak cough.

The symptoms are a deep cough and fever, and as the disease advances the symptoms of pneumonia become very pronounced. The point to be borne in mind is that this little threadworm is so minute that it very often escapes detection and that the disease is therefore very often mistaken for pneumonia. The worm is of a reddish color, from ¾ to 1½ inches in length. The head is not winged. It is slender and always invisible in the frothy mucus in which it is imbedded. They usually gather in clusters. It is believed that these worms gain access to the lambs with the forage, the grasses of the pasture, especially those of low, marshy soil, where land is subject to overflows, where the drainage is not perfect, and that where sheep have been infected they may by their excrement or coughing up saliva infest old pastures. It is therefore important not to pasture on any ground where infected sheep have pastured. The complete life history of the worm is not fully determined. It is supposed that the young worms escape from the lungs with the expelled mucus, but just what becomes of them when they reach the ground has so far not been definitely ascertained. It is supposed that they undergo a certain change either on forage plants, marshy grounds, stagnant water, pools, and the like, and are in this way again taken up with the food. However, the zoölogists are not unanimous on the exact life cycle of this worm. Some have suggested that the worm enters the lungs by the way of the stomach or through the air passage, the trachea; however, all this is problematical, as nothing definite has been determined. We also know nothing as to how long the parasite must remain outside of the body and how long it remains in the body. There are yet a great many important things to be learned about this destructive parasite. On account of its being so very small this parasite enters the finest branches of the bronchial tubes, and because of the severe irritation that it produces, pneumonia soon follows. Where the worms are in great abundance in the lungs, it may on post-mortem examination be thought to be a case of tuberculosis on account of the nodular appearance of the lungs, due to the fact that the lung tissue in trying to arrest the progress of the inflammation produces a sort of stagnation that to the unpracticed eye may be thought to be tubercular.

Symptoms—These are severe from the outset. There is an intense coughing and difficult breathing. On account of the high fever the animal soon becomes very weak, shows symptoms of collapse, and death follows shortly. The most prominent symptoms are that the visible mucous membranes are very pale and the skin may have a yellowish color.

Treatment—The treatment should consist largely in prevention and in the destruction of the parasite. As stated, pastures should be avoided that have ever had sheep on them that were affected with these parasites. If it is due to bad drainage where stagnant pools have been allowed to flourish, this should be remedied so as to avoid in every possible way having the flock infested. If proper drainage cannot be secured and these small pools cannot be avoided, then some disinfectant should be placed in them. A very good disinfectant is a small amount of crude petroleum, allowed to float on the surface of the pond, or better yet, a weak solution of copper sulphate, weak enough so that if stock should drink from the pond it would not be injurious to them and yet strong enough to prevent the germination of these parasites. Another method, where it can be practiced, is to cultivate the pasture or disk it so that the eggs will be turned under.

THE LARGE LUNGWORM (STRONGYLUS FILARIA, RUD.)

Plate IV.

This is also a nematode worm. It is the larger worm of the two. It is from 1 inch to 2½ inches long. It is the one most commonly referred to when a parasite is found in the lungs. It is very often found in the trachea and in the bronchial tubes. This worm is described by Leucart and many other prominent writers. The life cycle of this worm as well as of the other is not definitely determined.

Symptoms—The symptoms are very nearly the same as those of the small lungworm just described, only that the large lungworm does not produce pneumonia so often but is more liable to cause bronchitis.

Treatment—The treatment should be preventive so far as possible. Medicinal treatment has not given good results. Probably the most satisfactory treatment is by means of coaltar dips, placing some on bran and pouring hot water over it and having a cloth over the animal's head so that the vapors will be inhaled. This treatment is laborious. It seems that nothing is better to give internally than turpentine; about a dram may be mixed with oil or milk and given with a bottle as a drench. This seems to give more satisfaction than any other internal remedy that is recommended. Where the bran and hot water are not convenient, a hot stone or a hot iron can be used and the dip poured over it and the vapors caught as they rise.

THE BOTFLY OF SHEEP (ŒSTRUS OVIS, LINN.)

Plate V.

The sheep is infested with twenty parasites. The botfly is the only one that is conspicuously different from the others. It causes a great deal of trouble.

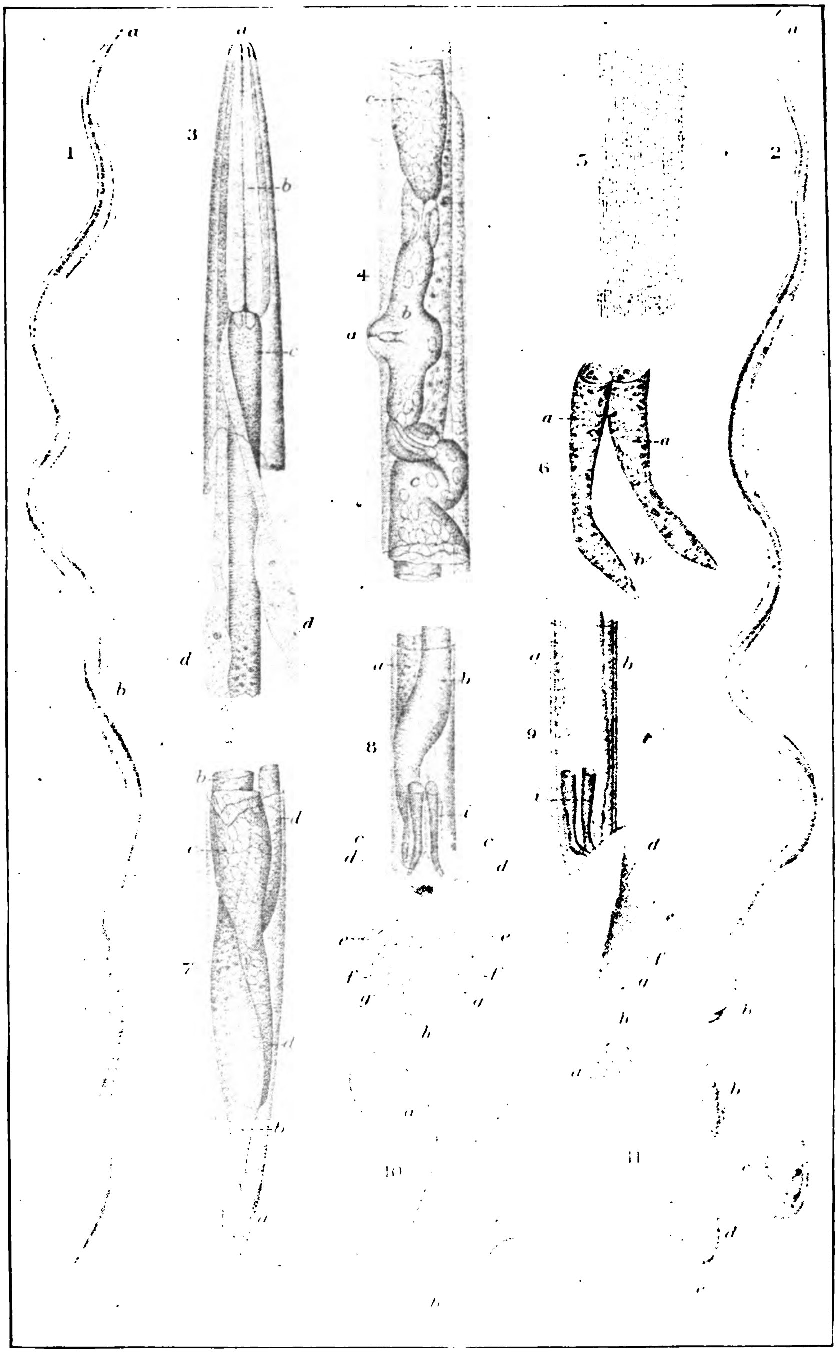
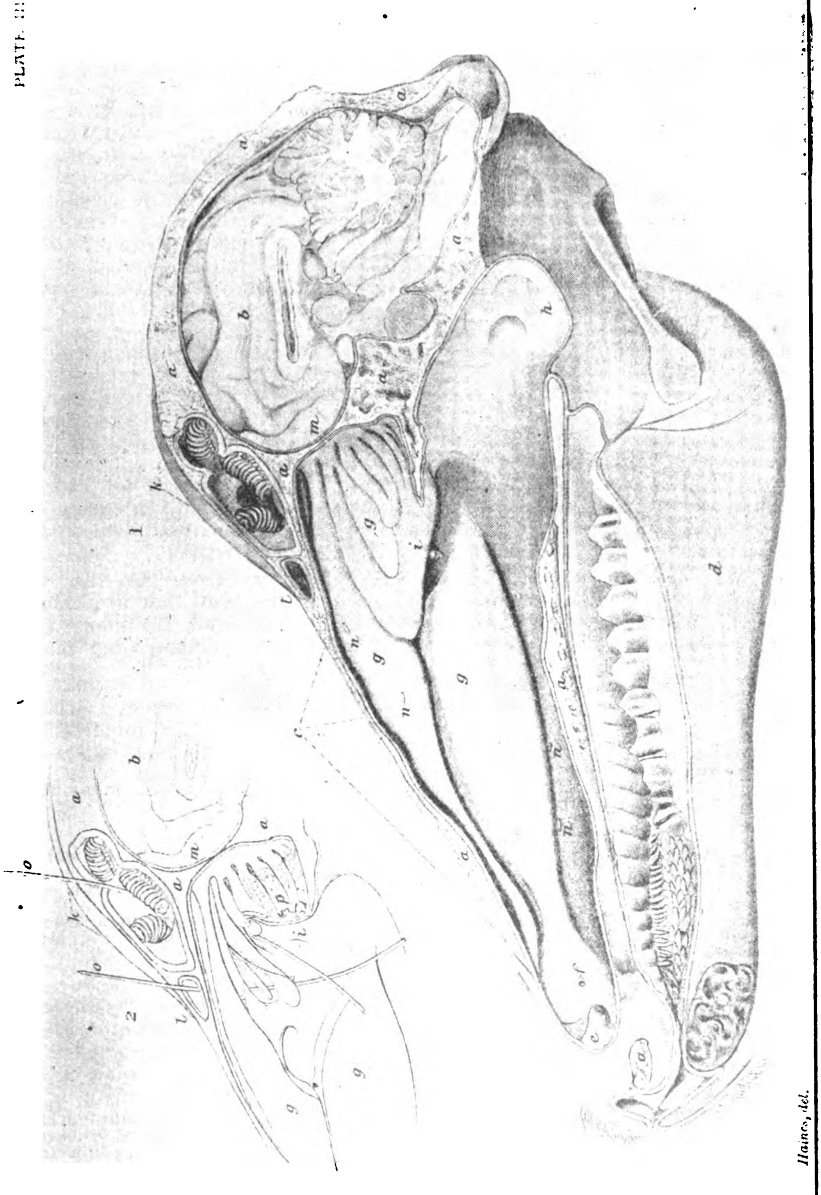


Plate IV.
Strongylus Filaria (Rud).



Haines, del.

Plate V.
Oestrus ovis (Linn).

The flock masters call it grub in the head, for the chief symptom is a constant thick, semi-mucous discharge from both nostrils accompanied by sneezing. It has always been disputed among high authorities whether or not this botfly really produces any serious disturbance and whether it is the real cause of death, but the grubs found in the head of sheep certainly must produce some disturbance and cause the discharge that is always found when sheep are infested with these grubs, for it seems certain that these symptoms so characteristic must be produced by the grub that is located in the head. The fly has been well known to flock masters for many years. It usually darts about the sheep's head and at an opportune time deposits

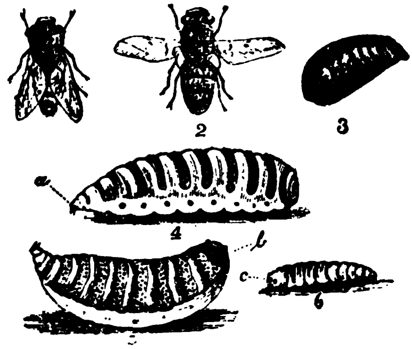


Plate VI.

Oestrus ovis: 1 and 2. Adult fly. 3. Pupa. 4. Full-grown larva, dorsal view. 5. Same, ventral view. 6. Young larva. 1 and 2 natural size, the others enlarged. (From Riley.)

DESCRIPTION OF PLATE IV.

Fig. 1. Adult female, x3: a, head; b, vulva.

Fig. 2. Adult male, x3: a, head; b, bursa and spicula. The dark line in Figs. 1 and 2 is the intestine.

Fig. 3. Cephalic end: a, mouth; b, oeophagus; c, intestine; d, unicellular glands.

Fig. 4. Middle portion of female: a, vulva; b, vagina; c, c, uteri with developing eggs.

Fig. 5. Piece of skin showing striae.

Fig. 6. Spicula: a, the fenestrated chitinous cylinders; b, the bulb-like enlargement of the surrounding membrane.

Fig. 7. Caudal end of female; a, anus; b, b, intestine; c, loop of the caudal uterus; d, ovary.

Fig. 8. Caudal end of male, ventral view: a, intestines; b, seminal reservoir; c, torn edges of the spread bursa; d, ventral costae; e, ventro-lateral; f, lateral; g, dorso-lateral; h, dorsal; i, spicula.

Fig. 9. The same lateral view.

Fig. 10. a, female, natural size; b, male, natural size.

Fig. 11. Eggs showing various stages of development of embryo in the following order: a, b, c, d, e, embryo escaped from shell.

DESCRIPTION OF PLATE V.

Fig. 1. Section of head of sheep made a little to the right of mesial plane: a, a, a, a, a, section of bone surrounding b, the brain, and c, the nasal cavity; d, the lower jaw bone; e, nostril; f, opening of tear duct; g, g, g, turbinated bones; h, the posterior opening of the nasal cavity, and near the opening of Eustachian tube; i, placed on the turbinated bone over a grub in the groove leading to the frontal sinus; k, the frontal sinus; l, the nasal sinus; m, the thin perforated plate of bone called the cribriform plate; n, n, n, larvae of Oestrus ascending the nares and wandering about its surface; i, one ascending to the sinus; k, opposite three, nearly mature larvae in the sinus. Figure reduced to three-fourths of natural size.

Fig. 2. Outline drawing of the skull surrounding the frontal sinus after removal of part of the turbinated bone, lettered as in Fig. 1; o, o, straws passed through the channels connecting the nares with the sinuses, marking the path by which the larva reaches the sinus; p, cut ends of the removed bones. (From Curtice.)

an egg on the nostrils. This work is done in an instant. The fly is larger than the ordinary house fly. It is of a brownish color. With the egg is deposited a very minute white grub that seems to have life. These grubs, or "maggots" as they are called, soon crawl up the nasal passages and attach themselves to the mucous membrane and absorb all the nourishment they can from the membranes, thus causing an intense irritation, resulting in sneezing and a profuse discharge, first watery and then thick, either from one or from both nostrils. It is estimated that these maggots live in the head for about ten months. When they become mature they are expelled by the act of sneezing and fall on the ground. On the ground they soon bury themselves about an inch or more in the surface and transform themselves into a pupa. In this state they remain from forty to sixty days, approximately, varying according to climatic conditions. The fly is again hatched out and will again produce these little maggots as before. Unless the flies appear in very large numbers they do not do any great damage, but when the nasal passages become greatly infested with the grubs it is then that they produce an irritation and a discharge from the nostrils. They can be operated on by inserting a little wire up the air passages as shown in Plate III. Flock masters say that when sheep are attacked by this fly they manifest excitement and fright similarly to horses stung by the botfly or cattle tormented by the hornfly. They get together and try to get under brush and in the shade. The sheep seem to remain in an excited state for some time. These flies appear to work chiefly during the afternoon. It is known that this botfly does not seem to have any other purpose than to propagate its species, for the entomologist tells us that it has no mouth part and no visible means of feeding, and for that reason the only mission it has is to propagate its kind.

Treatment—Flock masters seem to be divided as to the best method of prevention. Some claim that a sticky substance smeared on the nose of sheep will prevent the entering of the grub. Most of them use a mixture of pine-tar 2½ parts, cottonseed-oil 1 part, and sulphur 1½ parts. This can be rubbed on the nose. Another method is to place salt in a trough and bore holes in the same so that the sheep will lick it and then smear the above mixture around the holes, and in that way the sheep will apply the preventive themselves. Another is to keep the sheep in a cool, shady place, for it is found that the flies are more troublesome in the afternoon than in the morning and evening. When large numbers are affected it does not really pay to operate on them either by trepanning or by the use of wire or by injecting sweet oil into the nasal cavity, for the time and money does not always justify the operation.

STOMACH WORM (STRONGYLUS CONTORTUS).

One of the most troublesome parasites is the Strongylus contortus. It probably causes more severe losses than all other parasites combined. It is known as the twisted stomach worm. It is said that this parasite has seriously interfered with sheep raising in the East—that the majority of farmers have abandoned the raising of sheep simply because they could not keep this parasite from infesting their flocks. For this reason this parasite needs a great deal of attention and more thorough investigation. This parasite is a small slender worm, from ¾ to 1 inch long. It is found principally in the fourth stomach of the sheep. The body varies in color from a reddish brown white to a darker color, depending entirely upon whether the mucous membrane to which it is attached has an abundance or scarcity of blood. They adhere by their mouth to the mucous membrane or collect in little clumps or balls. The bodies are pointed, tapering towards the end.

"Mouth unarmed; male 10 to 20 mm. long. Caudal sac composed of two elongated lobes each with four ribs of which the middle and anterior are doubled; the right lobe has also an accessory projection. Two spicules with an accessory piece. Female 20 to 30 mm. tail elongated very sharp, sexual opening towards the posterior fifth of the body, covered by a strong tongue-shaped flap."*

This parasite is very easily recognized in the stomach of sheep on which a post-mortem is held. But it is important to hold post-mortems early on sheep because these worms are very readily digested by the gastric juices of the stomach, and then they are very apt not to be found or recognized. The life history of these worms is thought to be simple. It is supposed that in all probability they develop direct, and that the embryo, according to Leuhart, hatches in muddy or stagnant water and then undergoes changes and is taken up either with the food or drinking water, and that when it reaches the fourth stomach it completes its development, and that the eggs from the mature female worm contain the young embryo, and as the embryo passes from the intestines and falls on the ground, it is kept in a moist condition by nature and is again taken up either with the food, such as grass, or with the drinking water. If the infection is as supposed, this worm is of great importance, for the young sucking lambs also become infected with this parasite and the loss is severe. They have another way of becoming infested besides through the grass and drinking water, namely, the hind limbs and tail of the ewes become soiled by the discharges, and eggs adhere, no doubt, to the animal in the fecal matter, so that the lambs while sucking are apt to take up some of the eggs and to become infected in this manner. This seems the only way in which the lambs can become infested with these parasites. It cannot always be definitely determined by the symptoms whether sheep are infested with the parasites or not. This can be accurately ascertained only by a careful post-mortem examination, although flock masters who have repeatedly seen animals affected can make a very close diagnosis before holding a post-mortem. The lambs are more often affected than older sheep. This no doubt is due in a measure to their less power of resistance.

Symptoms—The symptoms resemble very much those seen when animals are affected with liver flukes. The animals become gaunt and show great weakness. They do not like to move and lag behind the rest of the flock. They have an unhealthy appearance. Their eyes are sunken and they have a dejected look. Their ears are cold and drooped. They have a stiff and staggering gait. The visible mucous membranes of the mouth and eyes are pale. They have in most instances a depraved appetite, eating dirt and craving unnatural things. The back may be arched. The droppings become soft, and just prior to death there may be severe diarrhea. These symptoms may continue for a day or they may last for several weeks, depending entirely on the natural strength of the animal. If a weak animal is affected the disease runs its acute form and the animal dies suddenly. If the animal has more resisting power, then it may take a week before death occurs. The treatment should first of all be directed to prevention. The following is an experiment that was tried by the Ohio Experiment Station:

"*An Experiment to Prevent Infection*—Early in the spring of 1899 the station undertook to make an experiment looking toward the confirmation of the generally accepted theory that the lambs or young sheep take the disease through infection from the pasture. We had, by the 15th of April, 46 lambs—14 Dorsets, 12 Southdowns, 13 Shropshires, 6 Merinos and 1 Oxford. The latter was put with the Shropshire lot to make an even number. Each of the foregoing lots was then divided as nearly equally as possible, with the exception that the youngest lambs were nearly all left in that division which was to go to the pasture with their dams, while the other half were kept in the fold from morning until evening, without access to their mothers. In the evening, between five and six o'clock, the entire flock was housed where one-half the lambs were kept through the day, and all remained there until about six to seven in the morning, when the ewes, with a part of the lambs, were taken again to the pasture. These lambs were practically all born between the 15th of March and the same date in April, and up to the latter date all ran with their dams upon pasture lands where sheep had run the year before. It was assumed that lambs so young would not eat grass and would therefore not become infected with the stomach worm. It should be distinctly understood that the lambs kept in (which lot will hereafter be designated as Lot 1) were so kept constantly from the middle of April until the middle of September. They were fed some bran and oats mixed, also some hay, but got very little green feed of any kind until some time in July. As will be noted further on, they had no green feed until after both outside and inside divisions had been weaned. The inside lot is designated as Lot 1, the outside one as Lot 2.

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*The Report of the State Board of Agriculture for 1894, page 306.

"In addition to the dry feed and hay, Lot 1 were given all the water they wanted, which was pumped from a driven well more than 100 feet deep. Both lots were weaned July 1, and both were kept in the sheep barn in separate apartments until August 1, when Lot 2 was again turned on pasture through the day but kept in at night. Within about a month after weaning seven lambs died out of twenty-three that had been running on pasture. An examination of three dead ones gave evidence of death from the stomach worm; the other four were not examined, but treatment with gasoline was begun at once; only, however, on the lot that had been on pasture. Two weeks later the three-day treatment was repeated, and since then we have not lost a single lamb from this lot.

"Lot 1 was kept in until about the middle of September, when they were turned out for their first pasturing on a patch of rape, and the other lot was put in with them, that the two lots might have the same pasture, the same chance at the feed trough and the same surroundings.

"In Lot 1 not a death has occurred up to this writing; two of the twenty-three, however, have not done well from the first, but they were twin lambs, fed from a bottle and always small, weak lambs."

The preventive treatment should be to keep the pastures and yards, so far as possible, from becoming infected with the droppings of the sheep, and if these places do become infected to thoroughly disinfect with those disinfectants that are available, such as carbolic acid or whitewash. Medicinal treatments are quite laborious and not satisfactory if several hundred head are to be treated, for all treatments take a lot of work and become troublesome. The Julian benzine treatment, which consists of benzine or gasoline, has given very good results with flock masters who have used it and kept the material used from reaching the lungs. The sheep should be housed the evening before being given the treatment and should remain without anything to eat until the next morning at ten o'clock, when a dose is given to each lamb. They are then allowed to remain without food for three or four hours longer. Then allow them to drink and eat until evening, when the same housing and fasting is repeated for two more days. The treatment is kept up for three days in all. After a week, the same three-day treatment is repeated, and should there during this time be no improvement it can be repeated again within ten days. Lambs can receive one-quarter of an ounce. In 1901 Dr. Stiles recommended the coal-tar creosote treatment, which is as follows:

Coal-tar creosote ....1 ounce.
Water......................99 ounces (6 pints and 3 ounces).

One ounce of this is a dose for a full-grown animal and is best administered with the morning feed. Or you may give them turpentine or gasoline, which should be administered in the swill, and best on an empty stomach. The best way to administer is by drenching. A drenching tube may be made by taking an ordinary tin funnel and rubber tube or hose, say 3 feet long and ⅜ to ½ an inch in diameter, and inserting into this rubber tube the lower end of the funnel. Then drench the animal by placing the rubber tube between the animal's back teeth, allowing the sheep to bite on it. It is also

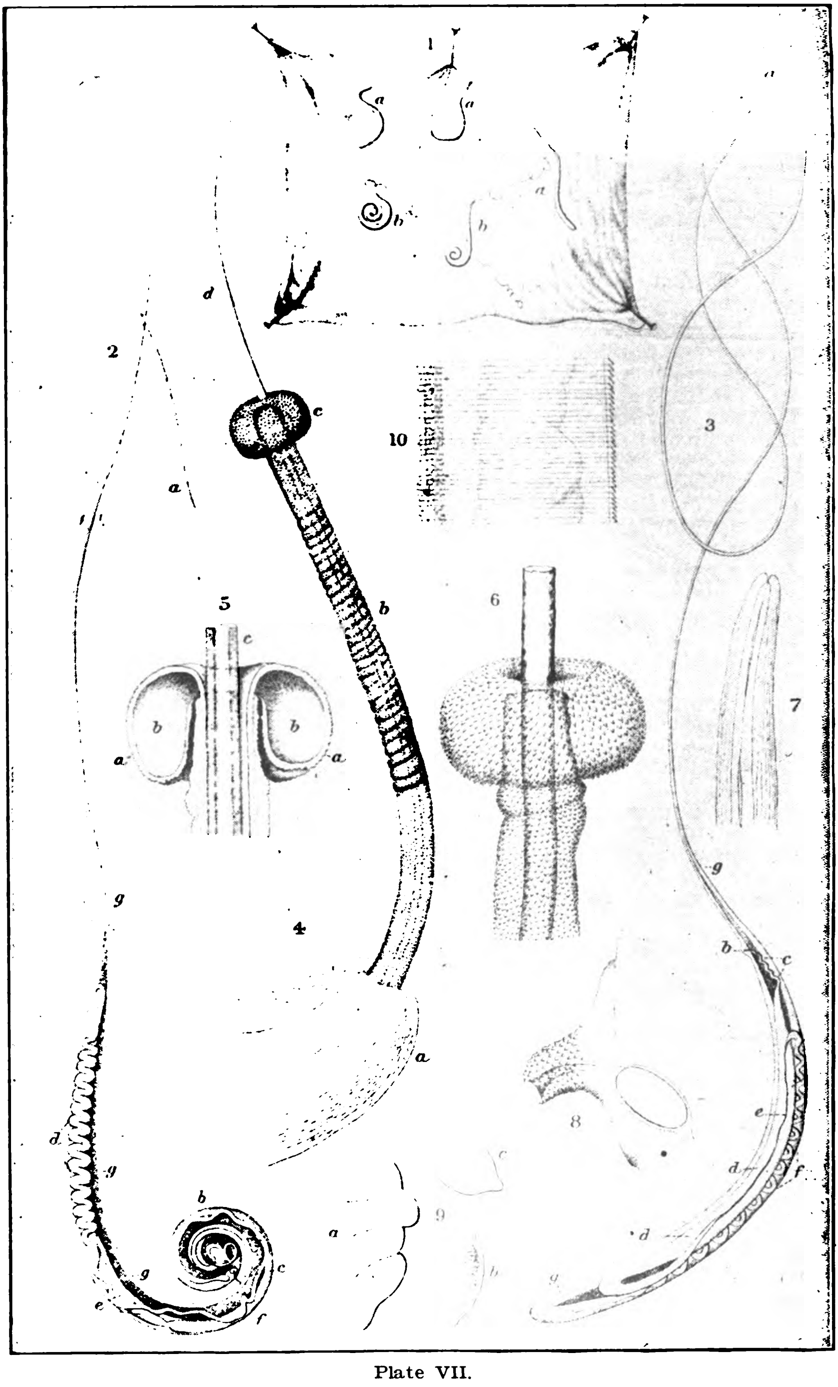

Plate VII.
Trichocephalus Affinis (Rudolphi).

well to place a piece of metal at the end of the rubber tubing, so that the animal may bite on it continually without stopping the flow of fluid by pinching the rubber hose. It is of great importance not to close the patient's nostrils while drenching.

This has not only been used by us for this parasite in sheep, but also for intestinal parasites in hogs, with very good success. Those who are careful in drenching so that the material will not reach the lungs are sure to have success.

THE CAECUM WORM (TRICHOCEPHALUS AFFINIS).

Plate VII.

This parasite is found in the large intestines of sheep. It is quite common. This worm is whip shaped. It can be found in almost all sheep, especially during the summer. The life history of the worm seems to be simple. After the eggs have passed into the ground they remain there and develop to a certain extent and are then taken up with the food and water into the intestines, where complete development takes place. These worms are not thought to do any great amount of harm, except when present in great numbers; or, if they happen to be in large numbers in conjunction with other parasites, then they may produce severe disturbance. The remarks concerning the prevention of the other parasites are applicable to this one. The treatment should be preventive, for what is known of this parasite indicates that the eggs pass out on the ground and into stagnant water, thus making recontamination possible unless guarded against. If the worm should become very troublesome the coal-tar creosote treatment could be tried. Flock masters state that this parasite is most often found on low, damp, and marshy pastures.

INTESTINAL ROUNDWORM (STRONGYLUS VENTROCOSUS).

This is one of the intestinal worms, and is quite important because it seems to do some harm. This worm is usually found in the fall of the year more than at any other time.

Symptoms—The symptoms produced by this worm are generally debility. There is a rapid emaciation, and in some instances symptoms of indigestion may be present, such as colic and the like. This condition is no doubt due to interference of the function of digestion. When this parasite is met with it is usually found associated with the Strongylus filicollis Rud. and Dochnius cernus Creplin. More commonly a sheep will be affected with these three prominent parasites, though others may be associated

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DESCRIPTION OF PLATE VII.

Fig. 1. Piece of caecum with trichocephali attached, natural size: a, a, females; b, b, males.

Fig. 2. Male, x7: a, capillary cephalic end; b, coiled caudal end; c, protruded intromittent organ; d, the convoluted, and e, the straight portion of the seminal apparatus; f, seminal reservoir; g, intestine.

Fig. 3. Female, x7: a, capillary cephalic end; b, vulva; c, vagina; d, uterus; e, oviduct; f, concoluted ovary; g, intestine.

Fig. 4. Caudal end of male enlarged: a, end of body; b, spine-covered tube of intromittent organ; c, its inflated end; d, spiculum.

Fig. 5. Cross-section of end showing how the outside sheath becomes converted into the inside sheath of the tube; a, a, the sheath; b, the sac formed; c, the hollow spiculum.

Fig. 7. The head.

Fig. 8. The vulva and vagina, with an egg in the passage.

Fig. 9. Eggs: a, eggs without shells; b, egg with shell and its characteristic polar bodies; c, intermediate between a and b.

Fig. 10. Enlarged portion of worm from near the head. (From Curtice.)

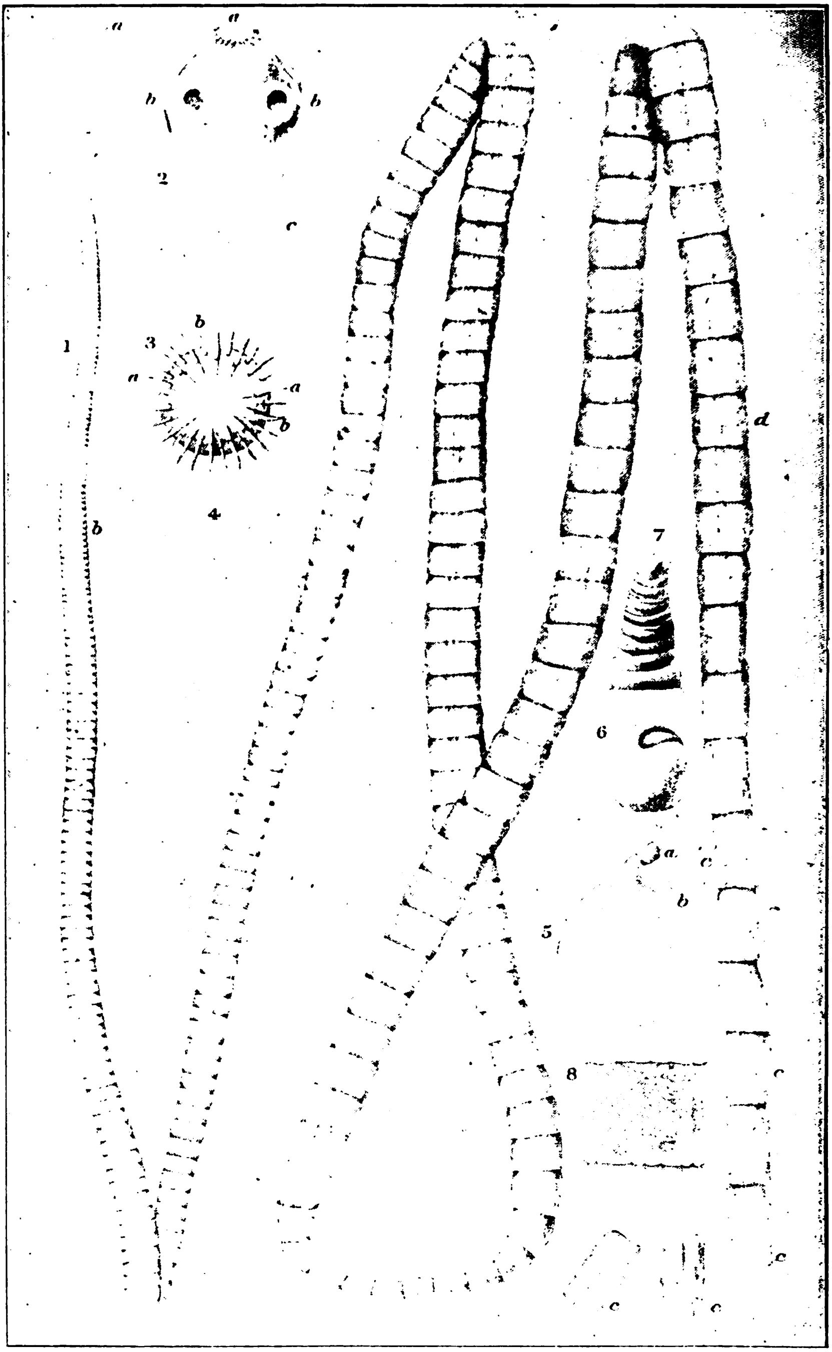

Plate VIII.
Taenia Marginata (Batsch).

with them. A great many sheep are infested with these parasites. It is often thought that when sheep are pastured with swine, the latter are the cause of infesting the sheep with these worms.

Treatment—The treatment should consist of prevention, avoiding all stagnant pools and disinfecting the pastures with slacked lime, or practicing the rotation of pastures with crops; all these are of benefit. Where pastures contain stagnant water it is important to have this condition corrected. If it cannot be prevented, a small amount of copper sulphate in solution should be added to the water to prevent the hatching of the eggs. Treatment of the disease is quite difficult, but we can recommend the withholding of food from the animal the same as in the case of the stomach worm, and giving the coal-tar creosote treatment recommended for the stomach worm.

BLADDER WORMS (TALENIA MARGINATA).

Plate VIII.

There are about four bladder worms which are important to discuss, first of which is the Taenia marginata. This is a cyst in the bladder. It is found principally between the layers of the serious membrane which form the mesentery. It may also be present in the liver. These bladders each contain a small worm and they are one stage of the development of an adult tapeworm. When these bladder eggs are taken up by the dog they develop into a mature tapeworm which has the power of producing young, the young pass out with the feces on the grass and are again taken up by the sheep with the food or drinking water and again develop into a cyst. The bladder is composed of a delicate whitish membrane. It is denser at one part than at another and this denser portion becomes more prominent as the bladder develops. This is the head and by it the bladder is attached to the cyst wall. This head is always fully developed with hooks and suckers, and when it becomes liberated or free it is then in a position to develop in some other host. It is supposed that it requires from fourteen to sixteen days for the egg—which is the first stage—to develop, and about eight weeks more for it to develop into a mature cyst. In this condition it can remain for a long time. Young sheep are the ones usually affected. When young sheep become infected to a large extent with this bladder worm they show symptoms of peritonitis, and then serious results follow. It is exceedingly difficult to diagnose this trouble during the life of sheep unless, by having made or witnessed a previous post-mortem examination, one has an inkling of what may be looked for. But the only safe way is to hold a post-mortem examination and when the bladder worm is found in the mesentery preventive measures should be instituted. There is no medicinal treatment that can be recommended. It is known that the dog is the intermediate carrier of the tape-worm and that the eggs are expelled by him, and so the dogs should be treated first. They should be

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DESCRIPTION OF PLATE VIII.

Fig. 1. Adult taenia, natural size: a, head (the constricted part following is the neck); b, point at which the reproductive organs begin to develop; c, c, c, adult segments either separated or about to separate.

Fig. 2. Head: a, the crown of twenty-eight hooks; b, b, the suckers or bothria; c, the neck, which is transversely wrinkled, but not segmented.

Fig. 3. Crown of hooks enlarged; a, a, large hooks; b, b, alternating small hooks.

Fig. 4. Form of single hook.

Fig. 5. Bladder or Cysticercus tenuicollis (taken from the omentum or caul of a sheep), which produces the taenia when fed to a dog: a, the head; b, the bladdery portion filled with fluid.

Fig. 6. Head of Fig. 5, enlarged; shows the opening from which the true head may be evaginated.

Fig. 7. Head of the cystic worm, evaginated, shows the suckers and crown of hooks.

Fig. 8. Segment from near d, Fig. 1, shows the branching uterus which is filled with ova. (From Curtice.)

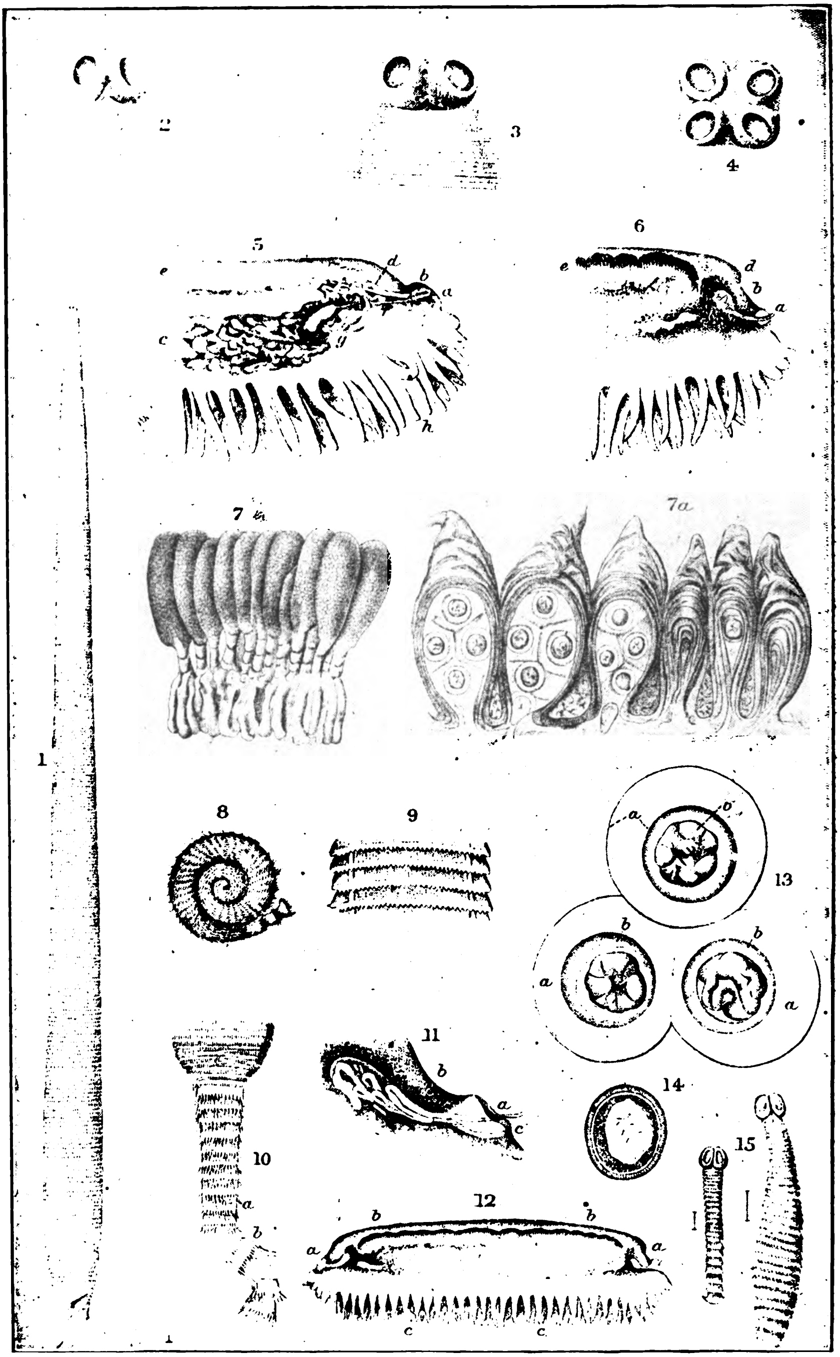

Plate IX.
Tænia Fimbriata, Diesing.

kept in a small pen and thoroughly cleaned from the parasite. The dog should remain unfed for at least twelve hours. The best remedy for the dog is areca nut, which seems to be the most effective. Care should be exercised to secure fresh powder. One can give of this freshly powdered areca nut about two grains for each pound of live weight. It is well to mix it with a little lard into a pill and give it in this form. The extract of areca nut does not act so well. The dog can be fed within a few hours after administering the medicine.

THE BLADDER WORM OF THE BRAIN (TAENIA CŒNURUS, KUCH).

This bladder worm infests sheep quite often. It is found in the brain and produces what is commonly known as "gid" or "staggers," and is often referred to as "turnsick." They are considerable smaller than the bladder worm just described. They are about the size of a hazelnut. The mature worm, as in the case of Taenia marginata, is found in the intestines of the dog. The embryo is taken up with the food or water by the sheep. The bladder worm of the brain is therefore the cystic stage of the tapeworm. It is found in the brain of sheep and interferes materially with the functions of that organ, for the pressure of the watery bladders on the brain produces the symptoms of staggering or of the animal turning to one side. The sheep may be seen turning around and around in a circle and when stopped it trembles. It takes about three months after they have invaded the brain for these cysts to attain the size of a hazelnut. The eggs, as stated, are taken up with the food by the sheep and enter the circulation and by the blood current are carried to various parts of the body, but it is said that those that are unfortunate enough to lodge in the brain or the spinal column finally perish. When the brain of sheep that show these symptoms of turnsickness or staggers is examined one will find the cysts.

Symptoms—The symptoms usually are dullness. Death may occur within a few days to a few weeks after the first indication of this trouble. The sheep show that the trouble is practically in the head. There may be spasmodic convulsions. The position of the head is held cramped, always on that side where the inflammation is intense. The eyes protrude somewhat, the visible membranes are highly inflamed and the animal shows that it is very much distressed. Mastication is usually interrupted. In the latter

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DESCRIPTION OF PLATE IX.

Fig. 1. Adult, natural size. From contracted alcoholic specimen.

Fig. 2. Head, edge view, x6.

Fig. 3. Head, side view, x6.

Fig. 4. Head, top view, x6.

Fig. 5. Portion of segment: *a*, genital pore; *b*, cirrhus pouch; *c*, seminal apparatus; *d*, the efferent tube; *e*, the rudimentary uterine apparatus; *f*, vagina; *g*, the receptacle of the semen; *h*, fimbriæ.

Fig. 6. Portion of segment more mature than Fig. 5. *a*, genital pore; *b*, cirrhus pouch; *d*, efferent tube; *e*, the uteri.

Fig. 7. The uteri enlarged.

Fig. 7*a*. The uteri still further enlarged, showing the contained embryo.

Fig. 8. A half-grown tænia; showing the fimbriæ, x2.

Fig. 9. Fragment of tænia from near head, showing the lateral excretory vessels.

Fig. 10. Terminal portion of adult, x2: *a*, segments which have lost their contractility; *b*, separated segments.

Fig. 11. External reproductive apparatus, x40: *a*, genital pore; *b*, cirrhus pouch; *c*, penis.

Fig. 12. Adult segment showing the symmetrical arrangement of the reproductive apparatus: *a*, genital pores; *b*, *b*, uteri; *c*, *c*, fimbriæ.

Fig. 13: Embryos as they exist in the uteri: *a*, *a*, envelopes; *b*, *b*, embryo.

Fig. 14. Embryo showing envelope and its six hooks.

Fig. 15. Youngest tænia found. Natural length indicated by lines at their sides.

All specimens except figures from 1 to 4 and 15 were drawn from fresh preparations.

stage of the disease the animals become very weak and stumble and fall. The disease can be mistaken for loca and in the early stages it resembles that of loco very much.

Treatment—The brain could be opened with a trepan but this is not practical when many animals are affected. The preventive measures recommended for Taenia marginata should be used. All dogs should be treated, and when these are treated there is no reason why the trouble should not cease.

FRINGED TAPEWORM (TAENIA FIMBRIATA, DIESING).

Plate IX.

This worm is quite common in the American sheep, especially in the West. It is found in the duodenum and the gall duct. It is very often found in great numbers. By a great many flock masters it is considered to be as troublesome as mange and scab. It is named fimbriata on account of its fringed appearance. Sheep are found to be infested with it during the entire year. It is also found in lambs as young as two months old. The adult worm is from 5 to 12 inches long and about 3-10 of an inch wide at the point of greatest width. These tapeworms grow by continuous segmentation at the head. Each segment is complete in itself. Each contains two sets of sexual organs, a male and a female. Just what becomes of this parasite from the time the egg is discharged until it is again found as a worm in the sheep is not known. When the worm is present in large numbers it retards the growth of the sheep. They become dwarfed and stunted, fail to put on flesh, and always seem to be hidebound. The disease manifests itself by the lambs continually losing in flesh, having a haggard appearance and being possessed of a depraved appetite, craving for earth and other things that seem unnatural. When the parasites become so numerous as to stop up the intestines and gall ducts they produce severe irritation. Often on account of the stopping of the bile there is a yellowish appearance of the mucous membrane of the mouth and eyes. The animal also presents symptoms closely related to those of loco. On account of impaired digestion the animals become weak and poor, their condition being practically one of starvation. Staggering gait and other symptoms similar to those described under the other parasites may be present.

THE BROAD TAPEWORM (TAENIA EXPANSA).

This tapeworm is very readily recognized on account of its appearance. It is very broad and very long, measuring from 11 to 16 feet in length. It occurs almost everywhere in the United States. It is usually found in connection with the other tapeworms. Just the extent of the loss attributable to this one worm is not definitely known. The head is not nearly as wide as the remainder of the body. This parasite can be found in the intestines of the sheep at all times of the year. This tapeworm is like the other just described in that the segments when mature separate and pass out of the intestines. The worms absorb their nourishment through the surface of the segments, they having no alimentary canal. The embryo exists in the mature segments. They are provided with small books by which they attach themselves to the mucous membrane of the intestines. The freed segments are passed from the intestines with the feces and it is presumed that they are eaten by other insects, and that these little insects, whatever they may be, that harbor the cysts, are eaten by the sheep and again set free in the intestines of the sheep. Flock masters seem certain that the sheep become infested on low, marshy pastures more often than in the feed lots. They also believe that overfeeding and exceedingly dry pastures can cause infection.

The infection from this tapeworm seems to be greater in the early spring and summer. The fact that it is not found to be so great when sheep are fed in stables and feed lots shows that the infection must be greater when sheep are pastured. These worms grow very rapidly. It seems that young lambs are especially susceptible. The shedding of the segments does not take place until some time after the worm has reached its full growth; then the presence of the segments becomes evident by the appearance of the white segments attached to the small balls of dung voided by the sheep. If the presence of these segments is observed in great numbers then serious results may follow. These parasites seem to produce considerable intestinal irritation, caused no doubt by their movements, resulting in a non-assimilation of food by the infected animal.

Symptoms—The symptoms of this disease are similar to those produced by the lung worm, the hide becoming dry and paper-like. The animal is hollow in the flanks, very thin, the membranes are pale and the animal is very weak. It is characteristic that they drink a great deal. There is also a depraved appetite. The gait is staggering, they cannot follow the flock but lag behind. In the advanced stages there is diarrhœa, which becomes very severe as it progresses and finally results in death. Diagnosis can be based on finding the segments of the worms adhering to the dung.

NODULAR DISEASE OF THE INTESTINES (ŒSOPHAGOSTOMA COLUMBIANUM).

Plate X.

This disease was many years ago mistaken for tuberculosis. Dr. Curtice discovered the true cause and also the parasite to which the disease is due. This is a very troublesome parasite, which apparently causes heavy losses. There is no doubt but that this affection is spreading among the sheep. A large per cent of the sheep killed at the abattoirs are found to have this trouble. The parasite is very small, being only 1-16 to ⅛ of an inch in length. It lives in the large intestines of sheep, below the caecum. The embryo forms tumors in the walls of both the large and small intestines and from the nodular form of these tumors the disease derives its name. In advanced cases of long standing these nodules are very thick on the intestinal walls. It is not uncommon for the nodular area to extend the entire length of the bowel, reaching almost to the rectum. Every one who has ever butchered sheep, or handled sheep for any length of time, no matter in what part of the country, is more or less familiar with this disease. These tumors increase in size as the worm within grows. After a time the worm escapes and floats loose in the intestines. The wanderings of the parasites from the time the eggs are discharged from the intestines till their discovery in the tumors are unknown. Recently Dr. Dalrymple has made investigations which show that the mature female lays its eggs in the intestines, the eggs hatch in a short time and the embryo or immature parasite passes in some manner through the submucous tissue or internal lining of the bowel and becomes encysted or imbedded there, and that the irritation produced gives rise to the nodules or tumors. The tumors are found in the submucous tissue and at first have the appearance of sacks filled with fluid. Later this accumulation turns into a green, cheesy substance, which continues to increase in amount. Invariably when a large tumor is opened one will notice that the worm has already left it. Not all sheep affected with these nodules in the intestines show any marked symptoms in the early stages, but in the latter stages of all affected animals prominent symptoms are a weakness and a paleness, the entire mucous membranes of the mouth becoming exceedingly pale. There may be profuse diarrhœa. Where death occurs it is no doubt due to the fact that there is not perfect absorption and

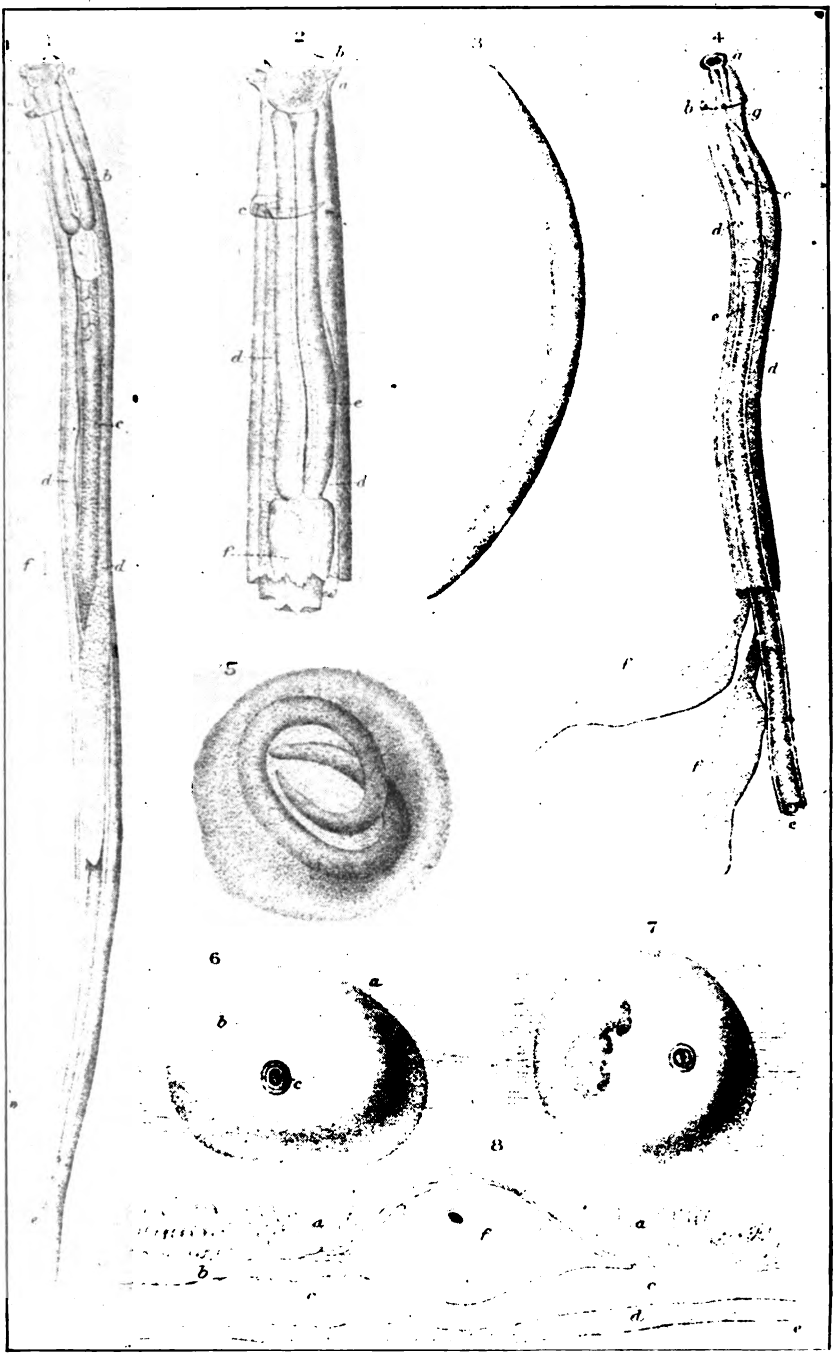

Plate X.
Oesophagostoma Columbianum (Curtice).

that the animal does not receive very much nutrition from the food taken up. In Bulletin No. 79 of the Louisiana Experiment Station Dr. Dalrymple gives his conclusions—reached after extensive experiments with isolated sheep—as follows:

"(1) That sheep suffering from nodular disease of the intestines, when placed upon a hitherto clean pasture, transmit infection to it through extrusion of the nodule-worm (œsophagostoma columbianum) from their bowels, probably with their droppings.

"(2) That when sound lambs are permitted to occupy a pasture so infected they will contract nodule disease.

"(3) That when the surface of an infected pasture is turned under by ploughing, and the land cropped, even for a single season, the infection may be destroyed.

"(4) That when sound lambs, are allowed to occupy and graze upon a pasture (previously infected) after being cultivated and cropped, as above mentioned, they will remain free from nodule disease.

"(5) That lambs, the progeny of ewes affected with nodule disease of the intestines, can be raised free from this disease, provided proper methods are adopted to prevent contamination, and,

"(6) That, if an infected pasture is placed in cultivation for a time, to destroy the parasites on it; clean lambs raised, as suggested by the method adopted by us, or purchased and known to be clean, and all affected sheep disposed of for slaughter (this ailment being confined to the intestines mainly, and not rendering the flesh unsafe as an article of human food), the disease may eventually be eradicated from both the land and the flock.

"As stated above, these conclusions have been arrived at from the results of our experiment only. For further information with respect to nodular disease in sheep, and its treatment in that animal, we would respectfully refer our readers either to our article on the subject in the first part of this bulletin, or to other works treating of this ailment.

"Owing to the fact that probably the majority of sheep butchered in different parts of the State seem to show nodules on their intestines, it would appear that our old sheep pasture lands, or ranges, are very generally infected with the parasites of this disease; and so long as the sheep remain on these feeding grounds, so long will the disease exist, by the animals becoming infected, and, in turn, re-infecting the land and themselves. When the time comes, however, for such lands to be placed in cultivation, and take their part in a regular system of crop rotation, we will then have little difficulty in predicting the material reduction, if not the extermination, of this, as well as other internal parasitic diseases of the sheep. But, even under existing conditions, it is questionable whether it would not be more profitable to abandon the keeping of large flocks of diseased and scrubby animals on the old infected ranges, and have fewer, but better and more

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DESCRIPTION OF PLATE X.

Fig. 1. Worm in third stage, x60: a, head, with chitinous armature; b, oesophagus; c, intestine; d, unicellular glands; e, anus; f, line denoting natural length.

Fig. 2. Cephalic end, lateral view, x150: a, chitinous cup; b, one of the six cephalic papillae (these are slightly distorted); c, side view of the neck-fold, under which the gland-ducts, d, d, open on the ventral line; e, oesophagus; f, intestine.

Fig. 3. Worm in first stage when 0.23 mm. long. No internal organs were seen in this specimen.

Fig. 4. Cephalic end, ventral view: a, head; b, neck-fold, near which are the neck papillae g, g; c, oesophagus; d, d, unicellular glands, which open under the fold b; e, intestine; f, f, glands.

Fig. 5. Worm inclosed in its cyst.

Fig. 6. Tumor from which the cyst in Fig. 5 was taken: a, surrounding tissue dissected from caecum; b, fluid-filled space; c, capsule with inclosed worm.

Fig. 7. Older tumor. This differs from tumor of Fig. 6, in having a movable cheesy mass. These tumors are distorted by compression, which makes them too flat.

Fig. 8. Section of an advanced tumor: a, mucous membrane; b, sub-mucous; c, inner muscular layer; d, outer; e, serous membrane; f, the cheesy mass of the tumor in which is a small section of the worm. (From Curtice.)

valuable ones of the improved breeds, on the farm—rather than on the range—where their feeding grounds could be periodically changed, which is inimical to the development of worms, and the sheep cared for and handled in an intelligent manner for the profit that may be obtained from them. Sheep husbandry is a profitable branch of agricultural industry, when conducted in a business-like way. But when sheep are neglected, there is no variety of domestic animal that will degenerate more rapidly, or succumb to the ravages of parasitic invasion more readily, with failure and loss as the inevitable result. Consequently, whoever hopes to succeed in the sheep-growing business, must become educated to its conditions and requirements, as has to be done by those engaged in, and make a success of, other branches of industry."

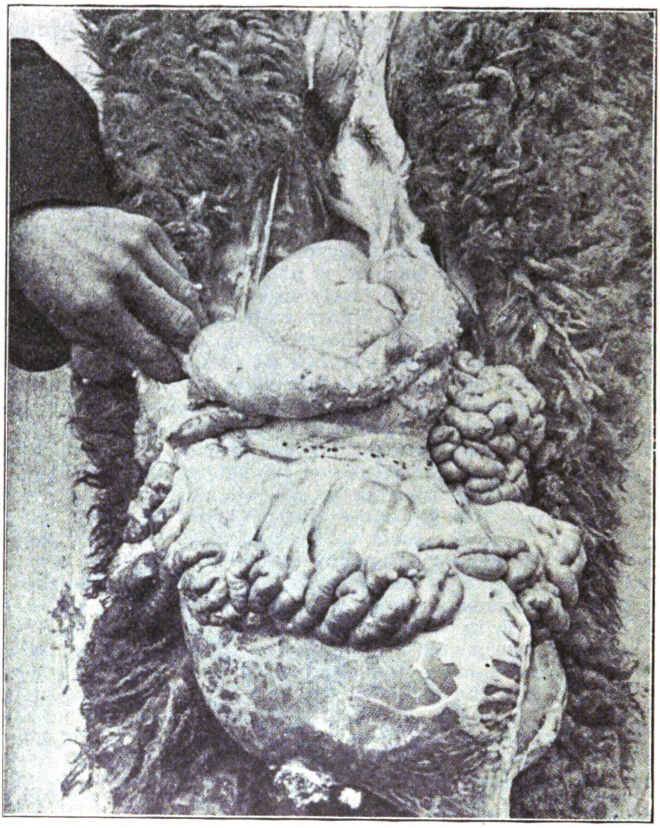

Plate XI.

Intestines showing nodule disease. (Stewart & Atwood.)

From the conclusions of Dr. Dalrymple it would seem that it is within the reach of every flock master to prevent this trouble by giving the necessary attention to sanitary regulations.

SHEEP SCAB.

Plate XII.

Sheep scab is a contagious disease. It is caused by a very minute animal parasite that feeds upon or just underneath the surface of the skin. This is one of the oldest diseases known to exist among sheep, and one of the most serious that affect this animal. The presence of this parasite causes a severe irritation. There are a number of mange mites which look very much alike, but it is very seldom that the species that lives on one kind

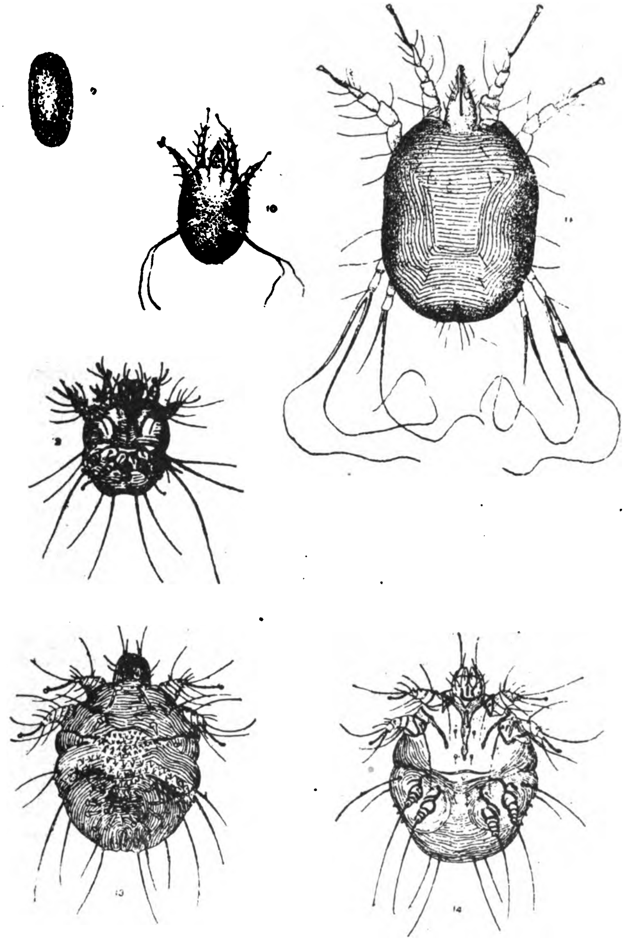

Plate XII.

Fig. 9. Egg of mite which causes common scab. Fig. 10. Six-legged stage of sheep scab mite. Fig. 11. Young female before moulting for the last time, dorsal view. Fig. 12. Adult male parasite of sarcoptic scabies of man (the corresponding parasite of sheep is very similar), ventral view x250 (after Blanchard). Fig. 13. Adult female parasite of sarcoptic scabies, dorsal view, x250 (after Blanchard). Fig. 14. Same, ventral view (after Blanchard). All greatly enlarged. (From Stiles.)

of an animal will live upon any other. For instance, the mange mite of the ox does not live on sheep, nor does the sheep mite live on the ox. This parasite causes wool growers an enormous loss each year, due to the shrinkage in the wool crop and also to a shrinkage in the live weight of the animal by reason of the continued irritation, as the animals affected with the mange mite will not fatten readily, but are thin and emaciated. This disease spreads very rapidly, due to the fact that the sheep when affected harbor a living creature. This little animal parasite is able to crawl freely and, as stated, either lives on the surface or burrows under the skin. Even in the immature state when in the egg the mite has a resisting power and can live off of the body of the sheep for several days if the climatic conditions are favorable. Understanding this, one can readily see the seriousness of having even one sheep affected with these mites. Gerlach very forcibly showed how contagious and troublesome this mite is, for he computed that in three months' time a single female would be responsible for the existence of 1,500,000 progeny, as is shown in the following table:

	Females.	Males.
First generation after 15 days produces..................	10	5
Second generation after 30 days produces.................	100	50
Third generation after 45 days produces..................	1,000	500
Fourth generation after 60 days produces.................	10,000	5,000
Fifth generation after 75 days produces..................	100,000	50,000
Sixth generation after 90 days produces..................	1,000,000	500,000

Other investigators have made the same observations, showing that Gerlach's experiments were correct. It will therefore become apparent how easy it is for these mites to infest a whole flock in a very short time, because the mange mite will be found on the posts or fences, and on the bedding, and thus whenever sheep are allowed to rub themselves, other sheep will come near these posts and become infested. This scab mite is a very small insect. It is only about 1-40 of an inch in length in the female and about 1-60 of an inch in breadth and is invisible to the naked eye. In appearance it is a round, ovoid body, with a small pointed proboscis. It possesses eight legs, four to a side, which are short, the front pair being the stoutest and the last pair the smallest. These legs are also supplied with suckers or what are known as "feelers." The newly hatched mite has only three pairs of legs, the other pair appearing about forty hours after birth. The color of the mite is a pinkish cream. The parasite is not easily recognized with the naked eye unless it is placed on a dark background. A very noticeable peculiarity of these mites is the long threads attached to the third pair of feet and which trail behind them as they travel. The males can be distinguished from the females by a more rounded appearance of the body. This parasite has very little power of locomotion. It causes a biting and an irritation of the skin, which produces an intense itching. It affects the shoulders, sides, flanks, back, neck and rump.

Symptoms—As one of the first symptoms when scab breaks out in a flock the sheep are seen rubbing against posts; they take hold of the wool and seem to pull it, and the wool has therefore a tagged or pulled appearance, making the fleece look uneven and rough. On account of the intense irritation that it produces, the wool fibers become stuck together. As the mites increase they produce an intense uneasiness among sheep. Where the wool has been pulled by continued biting and rubbing of the animal, upon examination one will find little white postules which are slightly elevated and the skin is somewhat inflamed. Sometimes large patches will occur on the sides of sheep. Flockmen become suspicious of a herd where they see the slight indication of loose locks of wool projecting from the fleece. If the sheep is not attended to at once, these scabby spots increase rapidly in size. The sheep becomes more uneasy and there is a continuous digging and biting. The elevations will become larger, due to the bites and irritation of the scab mites, and the mites can very readily be found on the wool fiber close by these elevations. In the advanced stage these spots become thickly covered with scales, or, as they are commonly called "scabs." It is then that

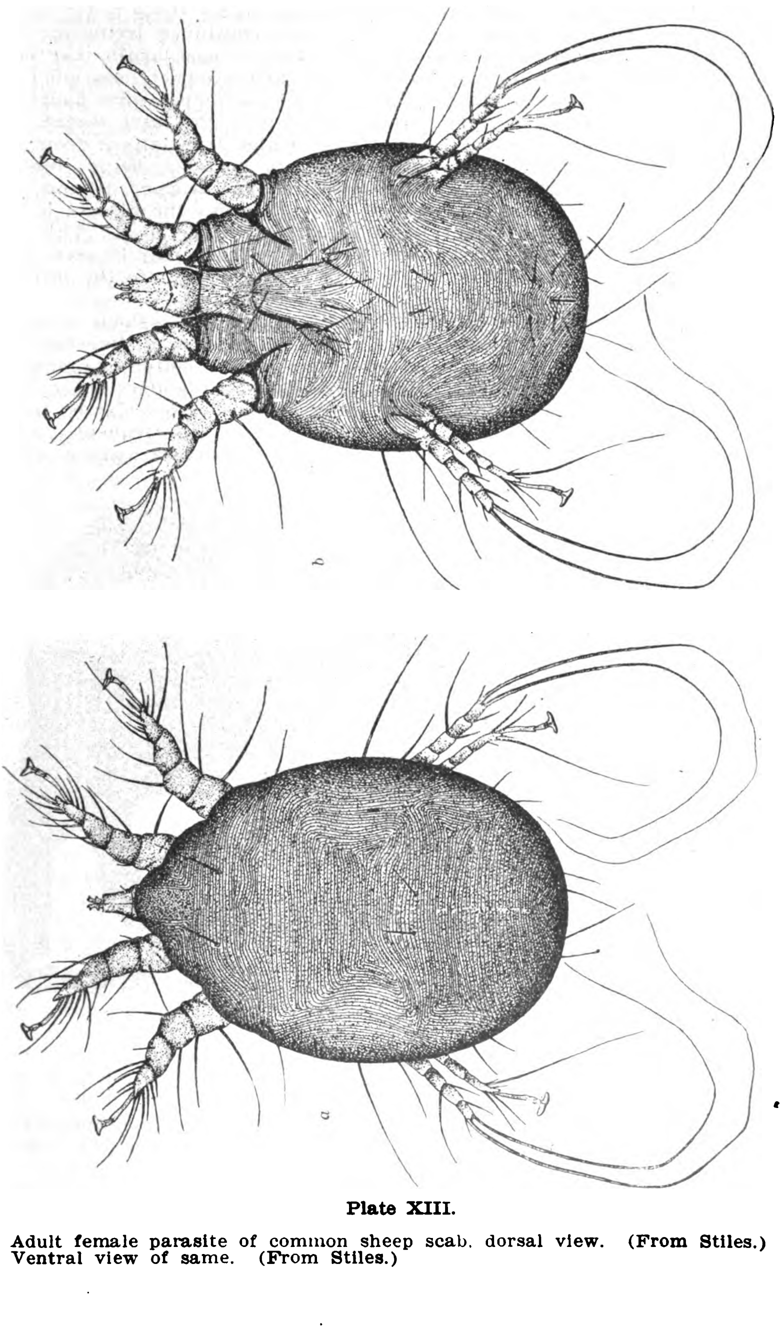

FIG. 2.—Adult female parasite of common sheep scab (greatly enlarged): *a*, View from above; *b*, view from below.

Plate XIII.

Adult female parasite of common sheep scab, dorsal view. **(From Stiles.)**
Ventral view of same. **(From Stiles.)**

the mite migrates. One will hardly ever find eggs under these heavy scaled processes. If the sheep become terrorized by the continued irritation they pull off these scabs and leave large surface sores. These again may soon be covered with a crust, only increased in size. If the owner does not treat them they soon become very much emaciated and the mange mite flourishes rapidly, and it is a pitiable sight to behold sheep in the later stages. As stated above, the disease spreads by the insect which transmits it from one animal to another or by the animal rubbing on posts or being infested through the bedding or through infested wool that has dropped off and they lying on it; or by placing a sheep in the flock that has the disease in the early stage, which will in a short time infect the whole herd. This can readily be seen by studying the table of Gerlach, where it may be seen what one female mite can do. How long the mite may contaminate the infected yards is not clearly demonstrated.

"Scabby sheep should never be driven upon a public road; sheds in which scabby sheep have been kept should be thoroughly cleaned, disinfected, and aired, and should be left unused for at least four weeks (better two months) before clean sheep are placed in them; fields in which scabby sheep have been kept should stand vacant at least four weeks (better six or eight) before being used for clean sheep; a drenching rain will frequently serve to disinfect a pasture, but it is well to whitwash the posts against which scabby sheep have rubbed. Even after observing the precautions here given, it is not possible to absolutely guarantee that there will be no reinfection, but the probabilities are against it."

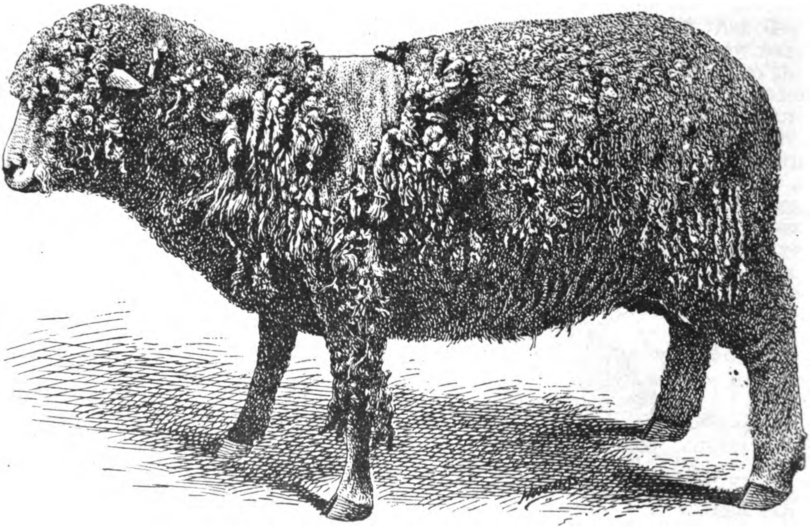

Plate XIV.

An advanced case of common scab. (From Stiles.)

It is, however, important that wherever scabby sheep have been pastured there should be thorough disinfection with quicklime and, if possible, the ground could be plowed under, which would be preferable, so as to stop the carrying of infection by birds and other animals. The proper thing to do is to dip. The government has done wonderful work with sheep scab and is rapidly eradicating the disease from our country by their rigid enforcement of dipping sheep that are infected. The government is using lime and sulphur as a dip, which is probably the cheapest and a very good dip, although the wool growers complain that it is injurious to the wool, and yet when properly made this is not true. Experiment stations have tried many kinds of dips. The coal-tar dips seem to give good results wherever thorough dipping is done. Every farmer who has sheep should dip them so as to avoid all danger of having this disease break out in his flock. A dipping vat on the average farm made like the one described for hogs is sufficient and will give good satisfaction, unless large flocks of many thousands are to be dipped, when larger vats should be used.

The proportion adopted by Rutherford, and afterwards made official by the scab sanitary authorities, are:

Tobacco leaves	pound, 1
Flowers of sulphur	pound, 1
Water (original formula, 5 gallons imperial, equivalent to 6 United States gallons)	gallons, 6

The advantage of this dip lies in the fact that two of the best scab remedies, namely, tobacco (nicotine) and sulphur, are used together, both of which kill the parasites, while the sulphur remains in the wool and protects for some time against re-infection. As no caustic is used to soften the scab, heat must be relied on to penetrate the crusts.

Directions for Preparing Tobacco-and-Sulphur Dip—The tobacco-and-sulphur dip is prepared as follows:

A. Infusing the tobacco: Place 1 pound of good leaf or manufactured tobacco for every 6 gallons of dip desired in a covered boiler of cold or lukewarm water and allow to stand for about twenty-four hours; on the evening before dipping bring the water to near the boiling point (212 degrees F.) for an instant, then remove the fire and allow the infusion to stand over night.

B. Thoroughly mix the sulphur (1 pound to every 6 gallons of dip desired) with the hand in a bucket of water to the consistency of gruel.

C. When ready to dip, thoroughly strain the tobacco infusion (A) from the leaves by pressure, mix the liquid with the sulphur gruel (B), add enough water to make the required amount of dip and thoroughly stir the entire mixture.

SHEEP TICK.

The sheep tick is a familiar parasite to every flock master and to one that has handled sheep for any length of time. This tick is about 1/6 of an inch long. It does not resemble the ticks found on other animals. It is of a reddish color when filled with blood and can very easily be found when on the animal by separating the wool. It is said that these ticks do not leave the body of the animal unless the sheep are so thick together that they can pass from one animal to another. This is due to the fact that the parasites are not winged and cannot fly from one animal to another. They live on the hair-like lice. They are only on the skin while filling themselves with blood. They are especially injurious after animals have been sheared. The amount of injury that these ticks produce depends upon the number of ticks found. One can distinguish this from true scab by finding the ticks.

Sheep should be dipped with either the coal-tar dips or the lime-and-sulphur dip recommended for scab.

THE SHEEP LOUSE.

The sheep louse is a very small insect. It lives at the base of the wool filaments and pierces the skin until the blood flows. This produces severe irritation. This condition causes the wool to drop off in patches just the same as true scab. There is an intense itching and this may be very readily mistaken for mange.

The treatment can consist of shearing or dipping the same as for scab, and when those directions are followed the trouble will soon cease.

LIVER FLUKE.

There are two kinds of liver flukes:

(1) The large fluke (Distomum hepaticum) is a leaf-like, flat, long shaped worm with its posterior extremity wedge shaped, about 4 m long and 1 m broad.

(2) The lancet shaped fluke (Distomum lanceolatum) is much smaller than the above and narrower in proportion to its length.

Life History of the Distomum Hepaticum—The eggs of the fluke are found in the fecal matter, and under favorable temperature and moisture a spine covered embryo is formed which lives in snails (Linnaeus). This larva is transformed in germ cells which produce the future cercaria. In these germ cells a brood is developed (attenuated cercaria). They are very minute parasites which live free in water or on marshy ground, where they become encysted on weeds or blades of grass, and are swallowed by animals. Infection takes place in the summer and fall until the first frost. Damp pastures should therefore be avoided. From the stomach they pass into the intestines and then either through the intestinal vein or through the biliary passages into the liver; or they may bore through the walls of the intestines into the abdominal cavity and thence into the liver. From the liver they spread through the bililary passages, or they may bore through the same into the connective tissue of the liver or its veins, thus entering the blood, whereby they are carried to other organs (lungs, etc.) In the liver they become fertile and produce eggs which are passed with the feces. A single egg may produce as many as 1,000 flukes. The fertile distome wanders or migrates out of the liver back into the intestines, but numerous distomes may be found in the liver at almost any time of the year. Flukes may degenerate or calcify in any organ, but especially in the liver. The pathological changes are, as a rule, in the liver itself and are dependent upon the presence of the fluke in that organ. Isolated flukes are usually harmless. The bile ducts and the liver usually show no changes and in a normal appearing liver an isolated fluke may be located by incision and pressure on the bile ducts. When infection is extensive the bile ducts are greatly thickened; they degenerate and show on the surface in white or yellowish-white streaks involving the whole liver, terminating in the gall bladder. Upon incision hundreds of flukes will flow out with the bile from the ducts. The pathological changes, if any, can very easily spread as new connective tissue is formed, which compresses the liver, thus causing the entire organ to become enlarged and hardened.

(2) The lancet shaped fluke, which is not as frequently found as the large fluke, as a rule, causes no pathological changes or disturbances, even if present in large numbers, especially in sheep. To determine its presence an incision must be made into every liver, whereby a dark brown, thick fluid, which, upon close examination, contains great numbers of these parasites, will exude from the gall ducts. In some cases large flukes will bore through the gall ducts, which in passing through the liver tissue cause hemorrhages in that organ which indicate the direction the parasite has wandered. The hemorrhages leave connective tissue-like scars, suppurating nodules are very seldom found. It may happen that a fluke will lodge in the abdominal cavity and cause peritonitis. Flukes are very frequently found in cattle, especially those that have been grazing in damp pastures. A general disturbance is noticed only when the entire connective tissue

is hardened; the animal then emaciates. It often causes a watery consistency of the muscles. Thickened and newly formed tissue is found in the liver. Some years flukes are more numerous in sheep than in cattle and cause hemorrhages, thickening of the gall ducts, cirrhosis as well as emaciation and watery consistency of the flesh and often cause the death of large herds.

Distones are seldom found in goats and without any general disturbances. Isolated distomes may be found in the lungs, enclosed in a hard capsule, with a dark brown turbid fluid in which are degenerated distomes. They may also be found in other parts of the body, such as the muscles, the spleen and cutis. Liver flukes are rarely found in swine.

BLACKLEG.

This disease is very common among cattle. It is not very common among sheep, especially in this country. The writer believes that at times sheep may have died from blackleg where the disease has not been properly diagnosed. Blackleg is due to a specific germ. This germ enters a wound and there produces a characteristic tumor. It is known that this germ lives for many years in the soil and when an animal has a wound and comes in contact with soil that contains the germ it is in this way that the blackleg tumor starts. The period of incubation is about from three to five days. By this is meant that after the germ enters the wound it takes from three to five days for the animal to show symptoms of the disease. Blackleg is not really true to name. This blackleg tumor may appear on any part of the body. It is very often that the animal becomes affected while shedding teeth—having sore gums they develop a tumor on the head; also, oftentimes, on the back and on the rump. The skin of the tumor is cold and has the appearance of gangrene, it being dead. When one cuts into the tumor a peculiar kind of gas escapes and the liquid is of a frothy, real dark red. When placing the hand over the tumor it crackles as when you are crushing paper in your hand.

The General Symptoms—Rumination ceases, the animal has no appetite, has a staring look, stands with its fore legs apart, the gait is staggering and lame, respiration is hurried, and at times there are violent abdominal pains resulting in partial paralysis and unconsciousness. Death comes soon for the disease does not last very long. It is fatal in most instances.

Treatment—The treatment should be preventive and should be by the use of vaccine that is manufactured against this disease.

ANTHRAX.

This is a highly infectious disease. Anthrax is common among all animals. It is produced by a germ known as the anthrax bacillus. This germ has a remarkable power of resistance and grows whenever climatic conditions are favorable. It is found to a large extent in the southern states, and those states that have tanneries or receive large quantities of imported hides and goods from foreign markets are now and then subject to an outbreak of this disease. All animals are highly susceptible to the organism. The bacillus can be taken up with the food or it may be taken up through wounds.

Symptoms—The symptoms of the presence of anthrax are that very suddenly a number of animals die. They seem to be stricken as though they had died from apoplexy or mad staggers. They fall. This is often called the apoplectic form. The animal suddenly refuses to receive food, ceases to ruminate, there may be a marked chill, the animal becomes uneasy, the respiration and pulse are very much quickened, the mucous membranes are of a real dark color; the animal becomes comatose or delirious, froth running from mouth, and it frequently tries to pass feces and urinates involuntarily. These are the prominent symptoms that are observed. Sometimes small carbuncles are found on the skin. Persons handling carcasses of animals that have died from anthrax must be very careful not to have any wounds, for human beings are highly susceptible to this disease.

Treatment—This should be entirely preventive. The premises should be thoroughly disinfected. The animals should be burned and where this cannot be done they should be buried deep with a liberal amount of quicklime. Everything that comes in contact with a diseased or dead animal should be thoroughly disinfected either by fire or some good disinfectant, and if not valuable should be burnt so as to prevent the spread of this disease. Preventive measures can be adopted by using the Pasteur vaccine against this disease.

BLOOD POISONING (MALIGNANT ŒDEMA).

This is due to an infectious bacillus. This bacillus usually produces an enlarged swelling of the legs or body. It attacks man and most of the animals, horses, cattle, sheep and pigs. It may attack young cattle, but older cattle seem to be more or less immune against it. The channel through which the bacillus enters is usually a skin wound. It especially infects wounds that have profuse exudate, where there is an exclusion of air; wounds where the blood does not circulate (blood stasis) are especially favorable for the development of this germ. These swellings are often mistaken for anthrax carbuncles and in young cattle they are often taken for blackleg tumors. As said, they occur in tissue that has been injured and rendered weak. Especially are wounds of a dropsical nature favorable to the infection.

Symptoms—Wherever the bacilli invade the tissue, there is a large, œdematous, boggy swelling which contains a great qffuantity of exudation. It is hot and quite sensitive to the touch. Whenever the wound becomes an open sore, there is exuded a yellow-amber colored fluid. This fluid may act as though fermented, becoming frothy, and has a peculiar odor like garlic. The swelling is characteristic in that it is soft in the center and that the edges are tense. Sheep very often become lame all of a sudden either on one or both hind limbs and upon examination one will notice that there is a swelling which is hot and sensitive and feels boggy to the touch. This may appear in animals that are in very low condition. It may appear after a bandage has been applied too tightly to a limb. It is often seen after an animal has received a wound caused by wire and the like. Some writers attribute it to bad food. Some also claim that it is due to too rich food, that it may be caused by the blood being in too rich a condition. These swellings usually occur on the limbs, on the chest, and under the belly. However, there is no part of the body on which these tumors cannot appear. In diagnosing this disease one must be careful not to mistake it for blackleg or anthrax. Whenever one is in doubt after making a post-mortem examination, a bacteriological examination can be readily made and the bacilli are easily found.

Treatment—On account of the many possible causes for the conditions that this disease manifests, one should investigate thoroughly what one produces the same. If it is due to feed or to allowing the animal to become very much debilitated such cause should first be removed. The prescribing of a laxative is indicated. This will gently act on the bowels and throw off the toxines. Potassium nitrate can also be given with very good results. When an animal is affected with this disease, dram doses of echinacea given internally are very beneficial. The tumor should be opened thoroughly and all the gangrenous tisue removed and the tumor then washed with a 5 per cent solution of carbolic acid at least once or twice a day. The prevention of this disease should be a thorough disinfection of the premises and the prevention of the accidental infection of any animal with this bacillus, taking extra precaution that the animals have no wounds and no way of producing them. If the wounds occur from barbed wire and the like that should be seen to so that it will not occur again.

TETANUS (LOCKJAW).

This is a germ disease. It is caused by a very small germ which is present in the soil. The disease is more common in real warm countries than in northern countries. The infection of the germ takes place through wounds, especially after surgical operations when the wounds begin to heal. It is seen more often after castration, due to the fact that the sheep has so much hair, the wounds thereby becoming very easily infected.

Symptoms—The symptoms are as follows: The animal stands and has all four legs stretched out, which are perfectly rigid and stiff; the neck is arched and very stiff; the jaws are closed and a stream of saliva runs from the mouth; the respiration is quick and the animal very excited; the eyes have a very staring look and death follows very shortly.

Treatment—This must be purely preventive. The wounds must be treated antiseptically, and whenever operations are performed they must be done under sanitary regulations. This is especially true when the operation of castration is performed. Treatment is not beneficial and over 90 per cent die that are stricken with this disease. However, when thorough preventive measures are used this disease may not occur often. I have in mind one instance where sheep were sheared with an instrument that was infected with these germs. Every sheep that was sheared by this man on one day died as a result of the wounds inflicted by these germ-infected shears, which inoculated the animals with the disease.

ACTINOMYCOSIS (LUMP-JAW).

Actinomycosis is caused by a fungus, and occurs more often in cattle than in sheep. It is very rarely found in sheep. Both Niles and Rushworth have seen the lungs affected in sheep. The fungus principally affects the soft tissue of the mouth. It causes an enlargement which results in the formation of a tumor composed of fibrous tissue. Upon manipulation the tumor feels hard and tense. It has a tendency to granulate. Finally the tissue breaks down, forming one or more centers of suppuration. The discharge is rather thick, yellowish, and more or less sticky. It may continue for a long time, as the tumor may heal over temporarily only to discharge again. Upon microscopical examination the ray-shaped fungus can be found in this yellowish discharge. Actinomycosis may affect any of the soft tissues of the mouth. It may also attack the tongue. If so, the organ is swollen, the animal has difficulty in masticating the food and there is usually an abundance of saliva running from the mouth. The fungus is not transmitted direct from one animal to another. It is found on certain grasses and grains, and they being eaten as food may lodge between the teeth, and if there is an abrasion of the tongue and gums, or a hollow tooth, these are all favorable seats of infection. Actinomycosis can also occur in the lungs or bones. It has its favorite seat in the upper and lower jaw and is found there more often than in any other place. When the fungus enters the internal organs it spreads by invading the entire tissues. The seat of infection is always very minute; it may not be larger than the point of a pin. If any of the internal organs become infected, such as the liver, spleen, and kidney, it must become so through the circulation. Sheep that are affected with this disease should be discarded as food. Mayo has shown that there is nothing in the theory that one animal will contract the disease from another by eating food upon which the pus from an actinomycotic tumor has fallen. By feeding animals food containing the pus of actinomycotic tumors he proved that it could not be produced in this way. As stated, actinomycosis most commonly affects the upper or lower jaw, causing a large tumor to form which finally breaks and has a yellowish discharge. This disease is characteristic in all animals that it affects. It is produced by a small parasitic fungus. It can be cured in animals by the use of potassium iodine.

Treatment—The treatment should be as follows: First open up the tumor and remove all the pus; then scrape the cavity thoroughly and apply tincture of iodine. If the sheep is a valuable one, it may be given ½ dram doses of potassium iodine. The iodine should be discontinued when iodism is produced, which is characterized by the symptoms of a severe cold, a discharge from the nose, etc. When these symptoms have subsided, then the iodine treatment should be continued.

SQUIRREL-TAIL GRASS.

A disease that often causes disturbances similar to those from actinomycosis is due to the plant known as squirrel-tail grass *(Hordeum jubatum L.)*. This weed is very troublesome. It has caused a great deal of annoyance, especially in Wyoming. The weed is spreading in other states. It is found in abundance in Iowa and many of the western states. It is often spoken of by farmers under the name of wild barley. It forms solid and compact bunches. The leaves are not unlike those of blue grass. It is made up of a number of one-flowered spikelets, three occurring at each joint, only one being perfect. Each spikelet has a dreadful-shaped, rudimentary floret at each side which is short and awned. These give to the plant the bristly appearance seen at maturity. The awns are barbed and so divergent as to give a very bushy appearance to the spike. As said above, the grass grows in a very bushy form, a single cluster of plants producing from several hundred to several thousand mature seeds. This plant has a wonderful faculty of stooling. The leaves are short and the spikelets are of a very light green or yellow and are very fragile. Wherever these weeds appear, either in cultivated meadows or hay land, they depreciate the value of the land, for they give in the cultivated land a great deal of trouble, and if found in the hay the hay becomes very much less valuable on account of the injurious effects it has upon stock, especially sheep, due to its long, rough awns. Squirrel-tail grass produces severe trouble, not only in sheep but in all animals. On account of the long, rough awns it penetrates the mucous membranes of the mouth very readily, and if the animal continues to feed from hay that contains this squirrel-tail grass, the awned heads will naturally be taken up with the hay. They are very fragile and break and adhere to the mucous membrane and lodge in the gums, and during the mastication of the food they work themselves down between the teeth and the gums and cause inflammation. By reason of the inflammation there is a swelling and a suppuration which, if the cause is not removed, will finally result in the ulceration of the jaw bone. On account of this continued suppuration the roots become loose and the teeth drop out. On account of the bone being affected there is a very offensive discharge coming either from the mouth or from the swelling. In this state the jaws become entirely disfigured, very much enlarged, and the affection is very often mistaken for actinomycosis. Upon examination one will find that these cavities contain a large number of the broken awns. These broken awns not only enter the mucous membrane of the gums, but they very often lodge in the mucous membranes of the nose and eyes, and on account of their peculiar form they will produce inflammation and suppuration wherever they lodge, and stock if not killed by them will certainly not to do well. In almost every instance the eye will be destroyed if not attended to at once. As described, squirrel-tail grass is the cause of the trouble, and wherever this grass appears in hay or pastures, stock should not be pastured on it, and the grass should be thoroughly eradicated because of its being so dangerous to live stock. Some stockmen have found these broken awns in the stomach.

Treatment—The treatment should therefore consist largely in prevention, and when animals are affected from this grass an operation should be performed to remove the awns and the wound treated as antiseptically as possible, and recovery will be prompt. Every one pasturing sheep should take due precautions against this grass.

We wish to acknowledge our indebtedness to the Bureau of Animal Industry for the following plates:
Plates 1, 2, 3, Bulletin 112.
Plates 4, 5, 7, 8, 9, 10, Animal Parasites of Sheep.
Plates 12, 13, 14, Bulletin 159.

State
Board of Live Stock Commissioners
# of Illinois

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A report on the Bacteriological and Physical Examination of Lung Tuberculosis in Cattle

BY

DIRECTOR E. SHARR and DR. OPALKA
From the Bacteriological Institute of the Agricultural
Department for the Province of Brandenburg

Translated from the German by A. T. PETERS

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A REPORT ON THE BACTERIOLOGICAL AND PHYSICAL EXAMINATION OF LUNG TUBERCULOSIS IN CATTLE.

BY DIRECTOR E. SCHARR AND DR. OPALKA.

From the Bacteriological Institute of the Agricultural Department for the Province of Brandenburg.

On account of the wide spread interest in physical examination for tuberculosis in cattle this article was translated by Dr. A. T. Peters, Director of the Biological Laboratory and published by direction of the State Board of Live Stock Commissioners of the State of Illinois for the purpose of education.

The establishment of the diagnosis of tuberculosis in living animals will receive a far greater importance since the enactment of the new imperial live stock sanitary laws. According to paragraph ten of this law it is compulsory to report all cases of tuberculosis, which have been diagnosed by a physical examination, and especially all advanced cases of lung, udder, intestinal and uterus tuberculosis. Inasmuch as the bacteriological examination of the udder, uterus and intestine is not a difficult one, this is not always the case for the bacteriological examination of lung tuberculosis in cattle. The reason for this is that the necessary material for a positive diagnosis can be easily secured from the udder, uterus and intestine, while on the contrary the material from the lungs is secured with difficulty. On account of the many differences which have been encountered many suggestions have been made. Of these the method suggested by Poel has given the best results, and seems has the least objections. It consists in taking the material direct from the trachea and bronchial tubes. According to the experiments of Neuhouse we are convinced that the material taken from the lung is best obtained with a cotton swab fastened to a wire which is pushed through the canula of a trocar, which has been inserted into the trachea and the swab is then pushed down to the bifurcation of the lungs. The important feature for us was first the construction of a suitable canula, so constructed that it could be easily inserted through the walls of the trachea and the surrounding tissue without first using the knife to remove a part of the trachea. The canula which answered these requirements was described by us in the Zeitschrift fur Hygiene und Infectionskrankheiten der Haustiere, (Nr. 5, 1911, seite 332). It was also necessary to find a suitable wire on which to carry the cotton swab into the trachea. This wire must be very fine and of medium elasticity and flexibility so that when it is inserted into the trachea it will not double up. With the help of the described instruments and the holding of the head in position which will be described later, we had no difficulty in inserting the cotton swab in the trachea and its bifurcation but in a few cases it was impossible to remove the swab through the canula. The wire which fastened the cotton to the carrier became entangled on the tip of the trocar and all that could be done in this case was to remove the trocar and the wire with the cotton swab attached together. This was not dangerous to the animals but it had this disadvantage that by the removal of the trocar and the cotton, the contraction of the muscles removed in part or wholly the material for examination from the swab. Whenever the above described case occurs one might be led to make an incorrect bacteriological diagnosis of the swab. To obviate this condition we decided to fasten the swab in a different manner, namely, by the use of a slide. Fig. 1 shows the manner in which the nickel sliding

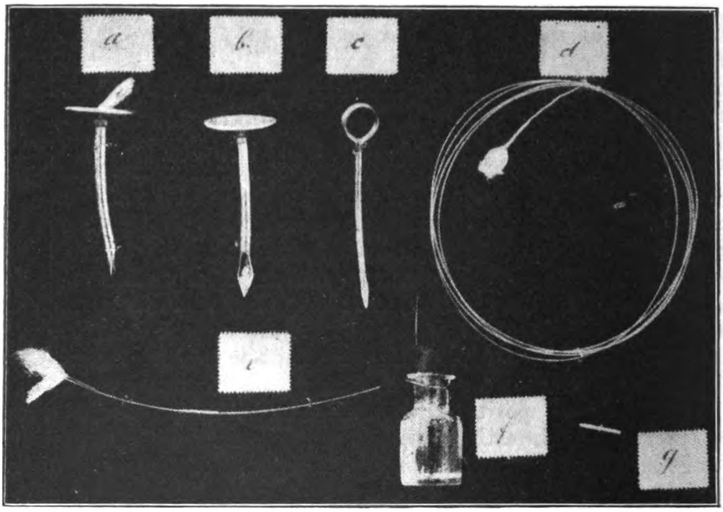

Fig. 1.

tube is passed over the bent wire which holds the cotton swab in place. This improved method of fastening the swab is simple and easily done and a reliable and positive way to successfully extract the swab from the trocar, because the sliding tube has a very smooth surface which is conical on the end which goes over the folded end of the wire. In this way all possibility of the swab becoming fastened is avoided. The following illustration shows the necessary instruments for the work:

a. Trocar (closed).
b. Trocar (open).
c. Stillette.
d. Roll of wire with cotton swab.
e. Upper end of wire with cotton swab inserted and slide for fastening wire in position.
f. Bottle for preserving and shipping specimen. Note how wire is cut off above cork.
g. Nickel plated slide.

Method of obtaining lung specimen from cattle. After applying the twitch to the nose, an assistant holds the head upward or a rope fastened to the twitch can be thrown over a beam or rafter and the head held upward in this manner. Another assistant standing on the left side of the animal holds the horns and turns the neck in such a position that the trachea is exposed to the operator on the right. See Fig. 2. After

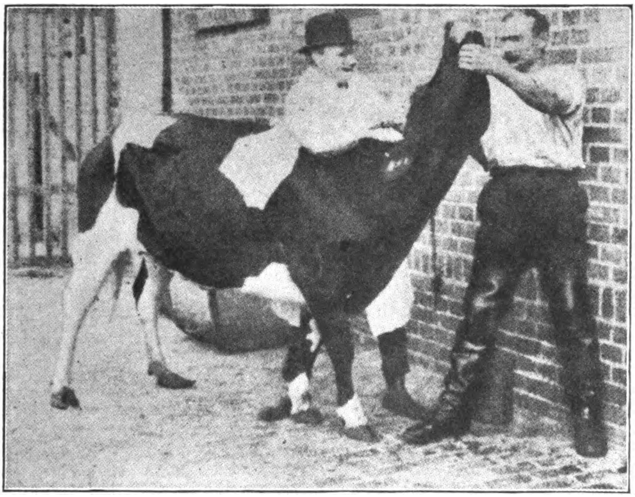

Fig. 2.

disinfecting the skin the trocar with stilette pointing slightly downward is inserted about three or four finger widths from the aboral end of the larynx into the trachea. See Fig. 3. It is not absolutely neces-

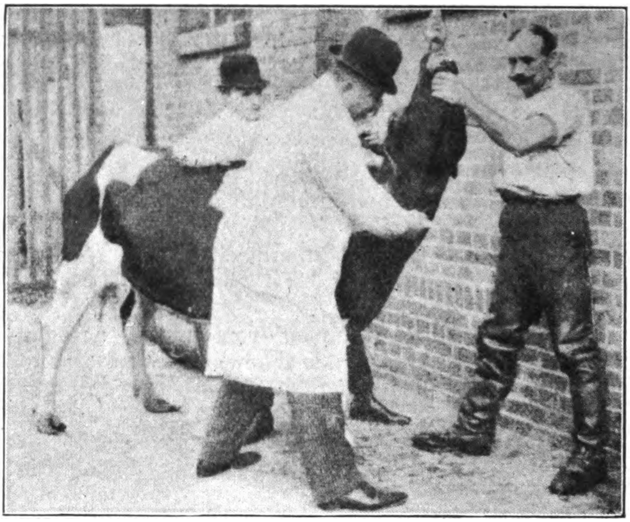

Fig. 3.

sary that the insertion should be made between two rings because the lancet shaped form of the trocar allows it to penetrate the rings with ease, even in old animals. See Fig. 4. After removal of the stilette

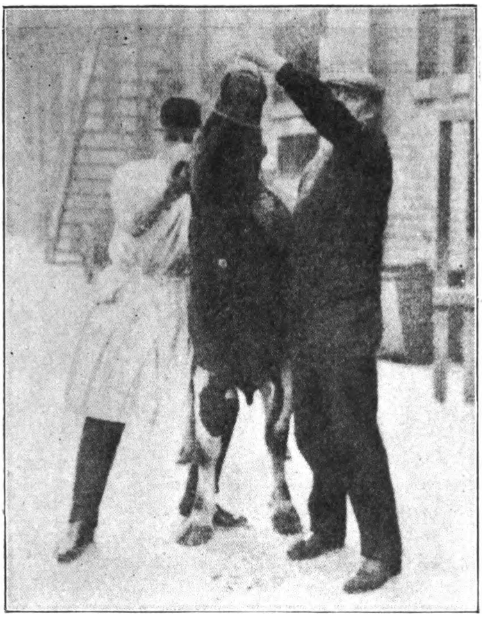

Fig. 4.

the wire with attached swab is inserted through the trocar into the trachea and its branches with little or no assistance, to a depth of one and one-half meters, then pulled up and downward and turned several times and removed. See Fig. 5. The slime covered swab is placed in

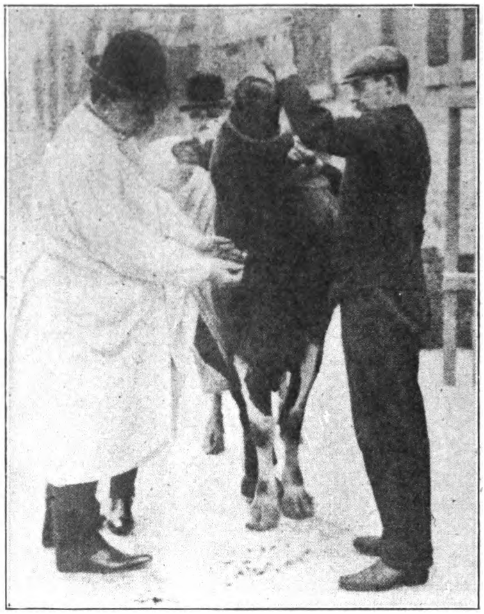

Fig. 5.

a labeled sterilized bottle in which condition it should be taken to the laboratory at the earliest possible moment, for bacteriological examination. Securing lung sputum by the above described method is not met with technical obstacles. The operation when properly performed should be bloodless and is not accompanied by any bad results, which we have demonstrated by many observations and experiments. Complications resulting from this operation are hardly possible, owing to the fact that the trocars sharp cutting surface makes only a small wound which readily heals in a few days. This has been proven by post mortem on animals which had been operated a few days previous. To form an accurate opinion of the value of this method of determining open tuberculosis in a living animal, we conducted numerous experiments on cattle at the slaughterhouse, the results of which will be given in detail. Thanks are due to Dr. Henschel, Chief Veterinarian of the Abattoir, who made it possible for us to conduct these experiments.

METHODS OF EXPERIMENTS.

1. Physical examination of cattle.
2. Securing lung sputum.
3. Post mortem examination immediately after slaughter.
4. Microscopical examination of a smear preparation from the swab.
5. Animal inoculation with material in at least two guinea pigs.
6. Post mortem examination of inoculated animals six weeks later.

NO. 1. PHYSICAL EXAMINATION OF CATTLE.

Cattle for experiments were taken from low land districts. With exception of No. 54 which was an emaciated cow, all others were in good physical condition. In some cases (No. 50 and No. 54) physical examination revealed a languid dull appearance of the eyes. Other symptoms by which tuberculosis could be diagnosed such as spontaneous coughing, a tough hide bound condition of the skin, a dry stiff lustreless coat of hair was only found in a few cases (No. 3, 11, 22 and 50 to 54). The physical examination of the accessible lymph glands was found affected in only one case. In this particular animal, No. 51, the left prescapular gland was the size of a man's head and was hard and rough to the touch. In connection with the physical examination of these animals, auscultation of the lungs was done in order to ascertain the deep breathing. The mouth and nose were temporarily covered with a leather cloth saturated in a solution of lysol.

NO. 2. SECURING LUNG SPUTUM.

After auscultation and physical examination all suspicious animals were subjected to the previously described method of obtaining sputum. The cough produced by the introduction of the swab into the trachea is helpful, inasmuch as it forces the slime into the trachea that would be otherwise inaccessible. On the other hand post mortem examinations have revealed to us that the cotton swab can be inserted into the diseased part and the diseased parts may be removed on the swab. This was especially noticeable in a case where the lobe of the diaphragm was affected. Occasionally when removing the swab through the trocar, pieces of tissue would adhere to it and upon bacteriological examination was found to contain tubercle bacilli.

NO. 3. POST MORTEM EXAMINATION AFTER SLAUGHTER.

As soon as the sample was obtained from the lungs the animal was slaughtered and a careful post mortem made.

NO. 4. MICROSCOPICAL EXAMINATION OF A SMEAR PREPARATION FROM THE SWAB.

From every fresh sample a number of smear preparations were made and stained according to Ziehl.

NO. 5. ANIMAL INOCULATION EXPERIMENTS.

Whereas, in the beginning we merely washed the swab in a sterile normal salt solution, which was subcutaneously injected into guinea pigs. From No. 30 on, the entire swab was used after taking only enough for a smear preparation. The reason for this change was that very often after washing and inoculating this material into guinea pigs, they would not contract the disease, while microscopical examinations of the material showed tubercle bacilli. On the other hand the inoculation of the entire swab into guinea pigs showed eight positive results, where the existence of tubercle bacilli in the smear preparation could not be found. It is therefore advisable in nearly all cases to resort to animal inoculation and to use the whole swab inasmuch as our observations have shown that animals stand this method very well.

NO. 6. POST MORTEM EXAMINATION OF ANIMALS SIX WEEKS LATER.

The general plan of observing animals inoculated six weeks can be terminated much sooner. In six cases the symptoms were prominent in ten days (cases No. 32, 36, 46, 49, 51 and 53).

The following table shows our experimental data and we wish to again emphasize that the first twenty-nine (29) cases of inoculations were those of a washed solution and all remaining ones were inoculated with the whole swab. Of the fifty-four (54) cattle physically examined and declared tubercular, fifty-two (52) cases upon post mortem examination revealed more or less tuberculosis, thirty-five (35) had lung tuberculosis, eleven (11) had tuberculosis of the lung and other organs, especially the pleura, three (3) had tuberculosis of the serous membrane (miliary) while only three had tubercular lymphatic glands. In two cases (No. 3 and 11) a number of pus clusters were found on the lungs on post mortem examination. Bacteriological examination revealed a number of streptococci and animal inoculation showed that the animal was not tubercular. Of the fifty-two (52) animals slaughtered for tuberculosis, forty-one (41) were found tubercular by the bacteriological examination, which according to their form, size and acid fast, were pronounced tubercle bacilli.

In twenty (20) cases the microscopical, as well as the animal inoculations revealed tuberculosis, and in eight (8) cases the diagnosis could only be ascertained by animal inoculation. The forty-one (41) animals by bacteriological method revealed tuberculosis, as follows: Twenty-eight animals had lung tuberculosis, eleven had tuberculosis of the lung and other organs and two tuberculosis of lymphatic glands.

From the information gathered by the bacteriological examination for lung tuberculosis we find the following cases (12, 20, 27, 28, 31 and 39) to have deep seated cheesy degenerated tissue, also that the disease had extended to the bifurcation of the trachea and made it comparatively easy to secure material in these cases. On the contrary the bacteriological examination in cases (30 and 34) showed no evidence of tubercle bacilli but the post mortem revealed only a slightly affected lymphatic gland. No evidence of tuberculosis could be found in the lungs or any other organ. It is interesting to note that these animals had been standing with others affected with open tuberculosis. The bacteriological examination failed to reveal serous tuberculosis, no matter how extensive. The claim that serous or latent tuberculosis is not harmful to neighboring animals is sustained by our investigations. If we summarize our results we find that we are able to detect from 78 to 84 per cent of extensive lung tuberculosis by the method just described. That not every case of lung tuberculosis could be detected by this method can be traced to the fact that in most cases the tubercle bacilli were incapsulated or existed in such small numbers that they escaped bacteriological examination.

CONCLUSION.

1. With the aid of our trocar and swab we are enabled to procure safely and easily sputum specimens without injury to the animal.
2. To obtain the most positive diagnosis the swab should be inoculated into guinea pigs.
3. From our experiments we conclude that open tuberculosis of the lungs can be detected in most all advanced cases by this method and in a few cases we were able to detect it in the earliest stages where no clinical symptoms (such as cough, emaciation, etc.) were present.
4. Serous tuberculosis cannot be positively ascertained by this method.
5. The described method is a valuable one for the detection of open tuberculosis in cattle. Though it would seem rational to destroy all tuberculous cattle, this cannot be done owing to the fact that the percentage of slightly affected animals is too great and the value so enormous that the State cannot afford to pay for them all. It is necessary for the sanitary officers to find a more economical method.

Animal No.	Results of physical examination.	Results of post mortem examination.	Results of bacteriological examination of sputum.	Results of animal inoculation.
1	Dry rales on both sides	Many pear sized caseous clusters in the bronchial and mediastinal glands; numerous caseous abscesses in the lungs	Few tubercle bacilli	Negative
2	Slightly arrested breathing in the upper third, dry rales on the left side	Many pea sized caseous clusters on the right portion of the diaphragm, bronchial and mediastinal glands the same	Small number of tubercle bacilli	Negative
3	Difficult breathing on the right side, with rales on the left	Many pea sized pus nodules on right portion of the diaphragm, bronchial and mediastinal glands affected	Numerous streptococci	Numerous abscesses in the liver and spleen: bacteriological examination revealed streptococci
4	Difficult breathing on both sides	The pleura covered with numerous masses of nodules, extensive purulent broncho pneumonia, cheesy degenerated lymph glands	Negative	Axillary glands caseated, also spleen bacteriological examination tubercle bacilli
5	Difficult breathing on both sides	Numerous pear sized caseous nodules and bronchial glands affected	Few tubercle bacilli	Negative
6	Difficult breathing on both sides, especially on the left	Few scattered cheesy abscesses in the bronchial glands, a large abscess at the base of left lung the size of a baseball	Negative	Spleen, liver and lymph glands studded with cheesy abscesses; bacteriological examination showed tubercle bacilli
7	Difficult breathing on left side, rales on right side, especially on the upper posterior end	Numerous calcified nodules on the right side of diaphragm, enlarged bronchial glands	Few tubercle bacilli	Generalized tuberculosis, numerous tubercle bacilli on bacteriological examination
8	Dry rales on both sides	Soft cheesy masses in both lungs, also in the lymphatic glands	Negative	Axillary gland caseated, spleen and liver the same; bacteriological examination tubercle bacilli

9	Dry rales in the right lung, and difficult breathing on both sides	Two soft abscesses about the size of a goose egg in the right lung, bronchial glands affected	Negative	Negative
10	Difficult breathing in the anterior portion of the left lung, rales on both sides	The pleura studded with numerous calcified abscesses; in the lungs were found isolated abscesses. Bronchial and mediastinal glands affected	Negative	The axillary gland and spleen were penetrated with abscesses; bacteriological examination tubercle bacilli
11	Acute breathing on both sides, slight rales.	Numerous pus abscesses in both lungs bronchial glands, slightly enlarged	Numerous streptococci	Ten days after inoculation purulent inflamation of the lungs, peritonitis pus abscesses of the spleen and liver; bacteriological examination streptococci
12	In the posterior upper left lung rales, the remainder acute breathing	The posterior left lung calcified abscesses, the same in the bronchial gland	Negative	Axillary glands calcified; in the spleen and liver small abscesses; bacteriological examination tubercle bacilli
13	Dry rales on both sides	Both lungs calcified, abscesses the size of a man's fist: bronchial and mediastinal glands affected	Few tubercle bacilli	Negative
14	Acute breathing on both sides and slight rales	Numerous abscesses from the size of a pea to a walnut in both lungs, bronchial glands calcified	Few tubercle bacilli	Negative
15	In the posterior upper third near the spinal column on both sides arrested breathing and rales	On both sides of the diaphragm numerous caseous abscesses; bronchial and mediastinal glands affected	Few tubercle bacilli	Negative
16	Acute breathing in the right lower third	In the right anterior lobe numerous calcified abscesses, same in the bronchial and mediastinal glands.	Isolated tubercle bacilli	Axillary gland, liver and spleen calcified abscesses; bacteriological examination numerous tubercle bacilli
17	In the upper right third difficult breathing and rales	In the right lung near base numerous abscesses the size of a walnut: the same in bronchial gland	Few tubercle bacilli	Negative
18	Both sides, rales and acute breathing	In both lungs numerous calcified abscesses, bronchial and mediastinal glands enlarged	Isolated tubercle bacilli	Negative

Animal No.	Results of physical examination.	Results of post mortem examination.	Results of bacteriological examination of sputum.	Results of animal inoculation.
19	Slightly acute breathing with rales on both sides	Both lungs and bronchial glands affected with numerous calcified abscesses the size of a walnut	Few tubercle bacilli	Negative
20	The right upper third dry rales	In the right lung two large calcified abscesses the size of a child's head; bronchial and mediastinal glands calcified	Few tubercle bacilli	Negative
21	Both sides, the upper third, difficult breathing and rales	Both branches of the diaphragm numerous calcified clusters the size of a walnut; bronchial and mediasrinal glands calcified	Isolated tubercle bacilli	Axillary glands numerous calcified clusters, also in the spleen and liver; bacteriological examination tubercle bacilli.
22	Acute breathing and rales in the lower right lung	In both lungs numerous calcified abscesses; bronchial and mediastinal glands calcified	Numerous tubercle bacilli	Axillary glands, spleen and liver a number of calcified abscesses; bacteriological examination tubercle bacilli
23	Dry rales and acute breathing on both sides	A number of calcified abscesses, the size of a goose egg in both lungs and in bronchial glands	Isolated tubercle bacilli	In the spleen and the axillary gland a number of calcified abscesses; bacteriological examination tubercle bacilli
24	Acute breathing in the right lung and rales	In the right lung a number of cheesy and calcified abscesses; bronchial glands calcified	Isolated tubercle bacilli	Negative
25	Arrested breathing in both lungs	Both lungs numerous calcified abscesses; the same in bronchial and mediastinal glands	Few tubercle bacilli	Liver, spleen and the axillary gland affected with numerous abscesses; bacteriological examination tubercle bacilli.
26	Arrested breathing in both lungs	Extensive tuberculosis of costal pleura and numerous abscesses in the lungs and bronchial and mediastinal glands	Few tubercle bacilli	Negative

27	Slightly arrested breathing in the right lung and dry rales	On the pleura a number of calcified abscesses the size of a hazelnut to the size of a walnut; in the right lung large calcified abscesses the size of a man's fist, also in the bronchial and mediastinal glands	Few tubercle bacilli	A smear preparation showed tubercle bacilli from the spleen and the axillary glands
28	Both sides acute breathing	In the right lung insolated abscesses the size of a hazelnut; on the costal pleura and pulmonalis the size of a walnut; bronchial and mediastinal glands affected	Few tubercle bacilli	Negative
29	Right lung acute breathing, expecially in the lower third	In the right lung two small calcified abscesses; bronchial glands affected	Negative	Negative
30	Acute breathing in both lungs	Bronchial and mediastinal glands enlarged and partly calcified; in the lungs no visible change	Negative	In the animal that had been inoculated four weeks later axillary gland cheesy degeneration; smear preparation showed tubercle bacilli
31	Acute breathing in both lungs	Extensive tuberculosis of the pleura, both lungs isolated abscesses; bronchial and mediastinal glands affected	Few tubercle bacilli	The spleen, liver and axillary lymph-node tubercular abscesses; bacteriological examination tubercle bacilli
32	Both sides acute breathing, dry rales	In both lungs a number of calcified abscesses the size of a hen's egg; bronchial and mediastinal glands enlarged and calcified	Few tubercle bacilli	Ten days after inoculation at the seat of same swelling appeared; smear preparation showed tubercle bacilli
33	Difficult breathing in both lungs	Acute tuberculosis of lungs and pleura, bronchial and mediastinal glands enlarged and calcified	Negative	Negative
34	Acute breathing in both lungs	In the bronchial glands numerous calcified abscesses, lungs apparently normal	Few tubercle bacilli	The axillary gland enlarged; smear preparation showed tubercle bacilli
35	In the left lung dry rales	In the left lobe of the diaphragm a number of abscesses the size of a man's fist; bronchial glands affected	Isolated tubercle bacilli	Four weeks after inoculation axillary showed tubercle bacilli on examination.

Animal No.	Results of physical examination.	Results of post mortem examination.	Results of bacteriological examination of sputum.	Results of animal inoculation.
36	Acute breathing in both lungs, lower third dry rales	In the pleura and peritoneum number of acute cheesy abscesses, in the anterior lobe of the right lung a number of abscesses; bronchial and mediastinal glands affected	Isolated tubercle bacilli	Ten days after inoculation abscess appeared at seat of inoculation; tubercle bacilli were found in the pus as well as in the smear preparation of the axillary gland
37	Arrested breathing in both lungs	Acute tuberculosis of pleura and lungs; cheesy degenerated bronchial and mediastinal glands	Negative	Negative
38	Acute breathing and rales in both lungs	Cheesy and calcified abscesses in the bronchial glands; lungs apparantly normal	Negative	Negative
39	Dry rales, and acute breathing in both lungs	In the anterior lobe of the right lung cheesy abscess the size of a man's head; bronchial and mediastinal glands affected	Isolated tubercle bacilli	Smear preparation from the axillary lymph-node showed tubercle bacilli
40	Acute breathing in the right lung and dry rales	In the bronchial glands a number of cheesy abscesses, the same in the right lung	Negative	Negative
41	Arrested breathing in both lungs and rales	In both lungs cheesy abscesses the size of a walnut, the same in the bronchial gland	Negative	Guinea pig destroyed four weeks later showed axillary glands affected bacteriological examination tubercle bacilli.
42	The left upper third rales, and acute breathing both in and expiration	At the base of the left lung a large cheesy abscess the size of a walnut and the same in the bronchial gland	Negative	Negative
43	In both lungs dry rales and acute breathing	Chronic tuberculosis, calcified abscesses in both lungs and in the bronchial glands	Negative	Negative

44	In the upper third right lung rales and acute breathing	In the right lung a number of calcified abscesses; the same in the bronchial gland	Isolated tubercle bacilli	In the spleen and lymph glands a numerous abscesses the size of a pin head; bacteriological examination tubercle bacilli
45	Arrested breathing in both lungs	A numerous layers of a peculiar growth on the pleura and lungs	Negative	Negative
46	Dry rales in both lungs and acute breathing	Numerous calcified abscesses in the lungs and bronchial gland	Isolated tubercle bacilli	Ten days after inoculation pus taken from the abscess at the point of inoculation showed tubercle bacilli, also the axillary gland
47	Arrested breathing and dry rales on both sides	A number of layers of calcified material on pleura; in the lungs a number of abscesses; bronchial and mediastinal glands affected	Isolated tubercle bacilli	Smear preparation from the axillary gland tubercle bacilli
48	Arrested breathing in both lungs	Isolated calcified abscesses both lobes of the diaphragm; bronchial and mediastinal glands affected	Negative	Negative
49	Acute breathing in both lungs	In the lungs a conglomerated mass of cheesy abscesses; bronchial and mediastinal glands affected	Isolated tubercle bacilli	Ten days after inoculation pus from the seat of inoculation showed tubercle bacilli; the same in the axillary glands.
50	The upper third of the right lung acute breathing, the left dry rales	Numberous calcified abscesses in both lungs and on the pleura: bronchial and mediastinal glands affected	Isolated tubercle bacilli	Bacteriological examination of the axillary gland and spleen, revealed tubercle bacilli
51	The upper third of the right lung arrested breathing, the left acute breathing	In both lobes of the diaphragm numerous cheesy abscesses; the left axillary gland enlarged to the size of a man's head; bronchial glands affected	Isolated tubercle bacilli	Post mortem on guinea pig nine days later, bacteriological examination of the axillary gland showed tubercle bacilli.
52	Arrested breathing in the upper third of the right lung, dry rales in both	In both lungs especially the right, calcified abscesses, bronchial glands enlarged and calcified	Negative	Negative

Animal No.	Results of physical examination.	Results of post mortem examination.	Results of bacteriological examination of sputum.	Results of animal inoculation.
53	In both lungs acute breathing and dry rales.	In both lobes of the diaphragm large abscesses the size of a walnut, bronchial and mediastinal glands calcified..	Isolated tubercle bacilli...	Nine days after inoculation at point of inoculation tubercle bacilli were found, likewise in the axillary glands..........
54	Both sides acute breathing and dry rales..	A numerous cheesy abscesses in both lungs; bronchial and mediastinal glands affected.............	Negative..................	The axillary lymph-node and liver and spleen cheesy abscesses; bacteriological examination revealed tubercle bacilli in large numbers.......................

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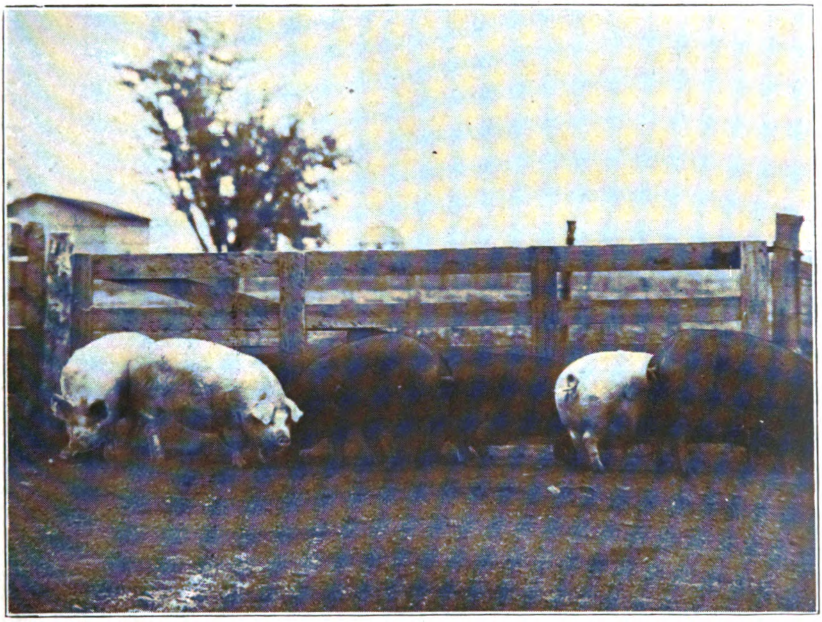
BULLETIN No. 6, JULY, 1912



The Importance of Keeping Live Stock on Our Illinois Farms and the Fertility of the Soil.

BY

PHIL S. HANER

STATE HOUSE
Springfield, Illinois

LIVE STOCK IN ILLINOIS.

The live stock situation in Illinois is very much different than what it was ten or twenty years ago. Many things have brought about this condition. Prominent among the causes may be found, first: the high price of land; second: the tendency towards grain farming brought on by the high price of grain; third: too much landlordism has had the tendency to make more grain farmers. As the average landlord does not want to keep up his farm so that the progressive renter can handle live stock, this is bringing about a condition that makes the department of soils valuable to the farming interest, for it is certain that the fertility of soil must be kept up in some way. In my judgment the combination of grain and live stock farming is the most rational and surely the most successful. We all know that live stock on the farm is a question that means much to the community at large and is at the time being discussed by the agricultural press and thinking people throughout the State. At the recent meeting of the Illinois Live Stock Breeders' Association, this thought was brought out time and again, that our live stock conditions were changing, and that the scarcity of live stock was largely due to the breaking up of the ranches in the west; that the states that for years were the centers of the breeding industry are now being homesteaded and therefore the large ranchmen virtually had to go out of business. Other sections of the country are being rapidly settled up, and I, in particular, refer to the western states and to Texas. Twenty per cent of these ranches in the last five years have gone out of business.

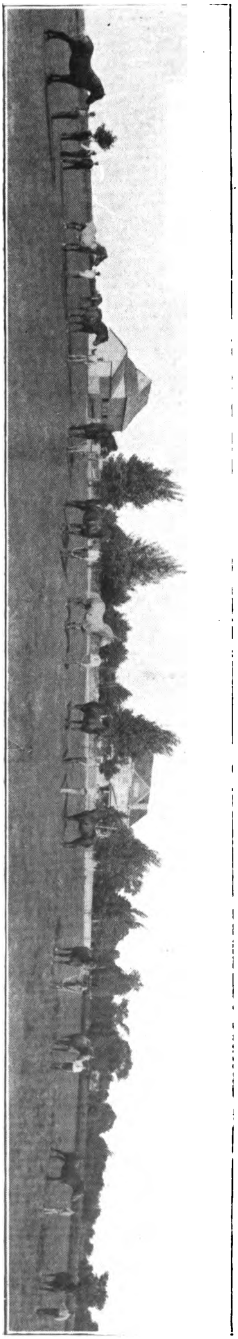
Some time ago I talked with one of our largest cattlemen who lives in Chicago and who owns two large ranches. He said, "I have been down in Texas. I generally buy my feeders down there, and I went there to buy at least 10,000 or 12,000 cattle. I bought 3,000 and wanted 7,000 more; I could not find them, and for the 3,000 that I bought I paid $7.00 a head more than I ever paid before, and they were not so much on quality either."

In addition to the ranches going out of business, the central states have quit raising calves, and what are raised are sold and go to market for veal. This also adds to the shortage. This practice by the farmer should be discontinued. Especially in the dairy districts do we see this practiced to a great extent, for there is not a single farmer in any of our central states, especially the State of Illinois, that does not have enough feed go to waste that could profitably feed these animals so that he could receive more for them and thereby increase the live stock of the State. I think this is one of the most important points for our live stock men to consider. It is on this account that we have no feeders on our live stock markets, and what are there, are so high that they can not be purchased and fed out with profit, and for this reason it is well for the Illinois farmer to note this condition and begin stocking up his farm with good live stock. It isn't the quantity of live stock that the Illinois farmer should look to, but the quality, because it is a fact, it takes just as long to feed poor animals and care for them as good ones, and the results are far more profitable.

The shortage of cattle in Illinois, especially in the central states, is not the only place where this shortage exists, for one can find it also in the west. Last fall when I visited a few western states I was amazed to find the range states short of cattle and at the Denver Live Stock Exhibition last January the average feeders sold from 6 to 6½ cents and the champion carload sold at 8 cents and I am free to state that the quality of these cattle was the best I had ever seen in carload lots. The prices paid for cattle in the west should show our Illinois farmers, breeders and feeders that they can afford to raise more cattle in Illinois. I doubt if it will be profitable for the feeders and breeders in central Illinois on our high priced land, to grow their own feeding cattle, especially on a large scale, but I believe that every farmer can raise a few good cattle on what he lets go to waste. If the people in Illinois would take the same interest in raising good cattle as they do in our western states, we would be able in a short time to be one of the great, if not the greatest, cattle state in the Union. A great portion of the cattle that topped the Chicago market last year were raised on our western ranges. A large per cent of the feeders sold at the Denver Live Stock Show last year were bought by Illinois feeders. It has been the history of all the older countries as they become more thickly settled, that cheap meat is a thing of the past. The United States has the best facilities for handling its beef, mutton and pork products of any country in the world, and we also have the greatest packing houses and the best system of meat inspection, conducted by the Bureau of Animal Industry, in the world. There is no country that has these two departments more systematized and more thoroughly organized than they are in our country, which is untold benefit to our people, thereby assuring them the best products that money can buy and also on account of these facilities they are enabled to send them to every known country in the world.

The government report of 1910 of the Bureau of Animal Industry shows that during that year 49,179,000 animals were inspected by the bureau. Of these there were condemned on account of disease, mostly tuberculosis, 113,772 entire carcasses and 874,221 parts of carcasses, approximately one million altogether or about two per cent of the entire inspection.

The live stock breeder has experienced and survived more trials than in any other branch of agriculture. Farmers are apt to become more or less frightened when the conditions are not always showing the most favorable results. Instead of thoroughly studying these conditions, they are apt to abandon the growing of live stock. Another condition which I wish to draw your attention to is the tendency to abandon live stock



for exclusive grain production. I do not believe that the average farmer has been justified in making this change. The fact should not be lost sight of that intelligent stock raising is more profitable than grain growing, for there is no question that through live stock on the farm the fertility of the soil is more readily maintained than by any other method. As an illustration: when I left the farm in the east on which I grew up the land was valued at from $150.00 to $200.00 an acre, and at this time this same land and land in that immediate locality can be purchased for $25.00 to $75.00 an acre. It was apparent to me when I visited there some few years ago that the farms that had not deteriorated were those of the dairy farms. These still continue to raise good crops and sell at good prices, which goes to show the importance of having live stock on every farm in the State.

They sold the farm I was raised on at $175.00 an acre. I visited there three years ago and spent a few weeks. I was offered the farm for $50.00 an acre. The farm on the north side of it was abandoned and lying idle. I said "who owns it?" I was told it was sold a few years ago, mortgage foreclosed.

When I was a boy everybody seemed to be prosperous in that country, and when I went back there I found only one man who was prosperous, one class I should say—and that was the dairyman. I believe this is true. If you would leave here and go there on the farm today and if you would undertake to make a living as you do in Illinois, you would starve to death as you could not make money enough on a farm to build it up. The land has been farmed to death and it is something that will come to our Illinois farms if we are not careful. I have relatives living on the farm there, and I found that they were hard up and not prosperous as they were when I was there as a boy.

One of the greatest drawbacks to live stock farming in Illinois is too much landlordism. A landlord moves to town and rents his farm to the highest bidder. He will not spend any money for improvements on this farm, and the renter therefore is unable to successfully enter into the live stock industry. After becoming a resident in town he strenuously objects to public improvements of any kind or any project that would be for the welfare or betterment of the community. We all know him, he's a first class "knocker." He is no doubt keeping this land to give to his children, but unless he keeps up the improvements on this farm he will give them a worn-out one like they are doing back east, and from which the boy and girl will be unable to obtain a livelihood. I think the landlord as well as the farmer should be educated in this respect. In speaking of the landlords I do not wish to be understood that I refer to the old pioneers who helped to settle our country and first plowed the soils of our State, for he went through many great hardships and we should have the highest respect for him, for corn sold at that time from 10 to 15 cents per bushel, but I speak of the landlords of our present generation.

The map of Illinois accompanying this article shows clearly the decrease of live stock in Illinois, and in the same length of time shows only a decrease of one per cent in grain, so it would seem that with our high priced land in Illinois we should raise better live stock and more of it. There are few farmers in Illinois but what could raise some live stock on their farms with the grain that is now going to waste. The time has come when people can raise live stock in Illinois to better advantage than ever before. This is due to the fact that they know how to utilize to the best of advantage the feed at their disposal, and the methods employed today are more rational and up-to-date, and by computing a balanced ration of the feed found on the farm, better results are sure to be obtained. A few years back when we had corn at 25 and 30 cents a bushel, we did not have to be so particular how we fed it, for it was not necessary to receive such very high prices for our stock as it is today.

Some time ago I wrote the different railroads for a list of the cars shipped by them out of five towns of each county through which their line passed. Complying with this request I received this information from most all of the railroads. Some of them gave me a list of their entire shipment of grain and live stock for the last five years in bulk, not designating any county from which it was shipped, and after compiling all this data, we found that it was not very accurate, so I decided to take just one road, the Illinois Central, and I believe the data which I received from them to be very reliable. This data required a great deal of their time and an expenditure of considerable money and I am indeed indebted to them for their courtesy and their valuable assistance.

The Illinois Central Railroad practically reaches every part of our State and the following figures will give you an accurate idea of the decrease in the live stock situation from 1905 to 1910:

From 1905 and 1906, 8,884 cars of live stock;
In 1909 and 1910, 6,986 cars of live stock;
Making a decrease of twenty-one per cent.
In 1905 and 1906, 21,708 cars of grain;
In 1909 and 1910, 21,415 cars of grain;
A decrease of one per cent.

To give you a more vivid illustration, I have divided the State into the following parts: northern, central and southern.

In the northern part there were 3,072 cars shipped in 1905 and 1906; in 1909 and 1910, 2,821 cars, or a decrease of 8 per cent.

In the central part there were 3,768 cars shipped in 1905 and 1906, and in 1909 and 1910, 2,561 cars, or a decrease of 32 per cent.

In the southern part in 1905 and 1906 there were 2,044 cars shipped, and in 1909 and 1910, 1,604 cars, or a decrease of 21 per cent.

The grain in the northern part in 1905 and 1906 amounted to 8,946 cars, and in 1909 and 1910, 7,562 cars; a decrease of 15 per cent.

In the central part in 1905 and 1906 there were 11,198 cars of grain shipped and in 1909 and 1910, 11,886 cars; an increase of 5 per cent.

In the southern part in 1905 and 1906, 1,564 cars of grain were shipped and in 1909 and 1910, 1,967, or an increase of 20 per cent.

This percentage shows just what I expected it would show from my personal experience in dealing with live stock men in various sections of this State. In all my experience of twenty years in the feeding of live stock I have tried to keep posted on the live stock situation, not only in my own immediate section, but throughout the entire State, and can show that these statements as given to you are correct.

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Recently I talked with a gentleman who said, "In my county we have had more grain in the last few years than we ever had." I said to him, "Who has the best bank account in your county, the man who has the livestock farm or the man who is strictly a grain farmer?" He said, "The man who has handled live stock as well as grain is the most successful." I am a believer in handling live stock as well as grain. I raised twenty thousand bushels of corn and bought seventeen thousand bushels more to feed with it, and I am not doing it for my health either.

In localities where a great many farmers were feeding live stock years ago, there are today but very few. There is no excuse for this condition, and I am sure there are many of you in the audience here today who will agree with me that these conditions do exist.

The thing to do is to start right now and put our shoulders to the wheel and endeavor to correct this condition. Aside from the natural shrinkage in live stock we have also a matter which the live stock men should be acquainted with.

I believe that live stock with grain farming has a tendency to assist in keeping our boys and girls on the farm. The gentleman farmer is more apt to lean toward grain farming, for, as I have often said it gives the grain farmer an opportunity to loaf three or four months in the year, but if he is interested in both grain and stock farming he is kept busy at all times. Keep live stock on the farm and I think you will have a very good attraction for keeping the boys there. Give the boy a part; make him feel a responsibility and teach him how to trade. A man who is not a fairly good trader will never be a successful live stock farmer, for if one has to rely on this work being handled by some one other than himself, he may be assured he will never receive full value for his labor. To make a successful live stock farmer he should know how to trade; he should know how to go out and buy and sell. To be a successful live stock farmer a man can not send an order into the market for a load of cattle and when he gets tired of them ship them back. He had better not go into the business that way. He will never be a successful live stock farmer. He must study the conditions and know what he has on the farm to feed and must take these things into consideration.

I wish to say further, that the improved methods for the care of live stock are being rapidly taken advantage of by all up-to-date farmers. Evidence of this fact is shown in the steadily increased use of the silo for feeding. The silo should be popular to an Illinois farmer for it takes the stalks, formerly allowed to deteriorate and largely waste in the weather, and preserves their feeding value. The farmer who feeds silage never will suffer a loss from the cornstalk disease. No other form of curing or storage makes all the coarse parts of the cornstalk fit for food. After it comes from the silo all classes of stock eat it with a relish. About forty per cent of the nourishment of the corn plant is left in the field where corn is husked from the standing stalks and is mainly wasted. Even when cut, shucked and kept under the most favorable conditions, the fodder will lose about ten per cent of its feeding value, while under the ordinary farm conditions twenty-five per cent or more is often lost. When fodder is fed there is a further waste of the stalk. This is not so with the silage. Silage when properly handled will not deteriorate from decay and fermentation more than five to seven per cent.

The average farmer engaged in feeding and who undertakes to feed ensilage to cattle, must have some knowledge how it should be fed to give the best results, but from what has been done in this line by the number of experiment stations, it has been demonstrated that the silo has come to stay, and that it is going to cut a great figure in the calculation of the up-to-date feeder. For as near as I can learn, ensilage, when it is put up right, care being taken that it is not mouldy, for it can then be fed with advantage to all kinds of live stock, and that cattle fed a little corn and cotton seed meal or molasses, fed mixed with ensilage will make rapid gains and at a great deal less cost, than with corn alone. In fact, it has been demonstrated that they will make a good profit fed in this way. Ensilage, however, cannot be fed exclusively, it must be fed in connection with other feeds. In feeding cattle at about 1,000 pound weight they should be fed one peck of corn and three pounds of cotton seed meal and three pounds of molasses feed. This is my ration for winter feeding. The past winter, when hay was so high and so scarce, I fed cotton seed hulls, which cost me $7.20 a ton layed down. From this winter feeding I have had the best results with the hulls, and would rather have them in connection with roughness, with the exception of clover hay or alfalfa. When feeding cattle on grass in the summer, one peck of corn and three pounds of cotton seed meal is my ration. I prefer feeding them just at dusk of the evening in place of feeding them this grain ration in the morning. I feel that I receive better results in feeding them the grain in the evening than in the morning for the reason that the cattle will graze all day long until dusk and will be filled of grass, whereas when I feed them grain in the morning they will fill up on the grain and will not fill up on grass and they will require double the feed. On this account I save more grain and get better results, for I have demonstrated that by this method they will not clean up a peck of corn, whereas if you would feed them in the morning, it would require almost double this amount of corn and, I am sure, would not give you as good results.

It is well known that the hog is the money maker and he gives to the average farmer quicker and better returns than any class of live stock grown on the farm. With the advanced knowledge of preventing the contagious diseases among hogs the farmers of the State should avail themselves of growing more hogs and better hogs than ever before. Hogs vaccinated by the simultaneous method at an average of three months of age, should be immune for the rest of their lives. For the reason that this serum is given to the stockmen of Illinois free, it should materially assist in stimulating this branch of the live stock industry.

In the last few years the dairy industry has made constant gain. This is as it should be. It is an old saying that the dairy cow is the mortgage lifter of the farm and very few that engage in the dairy business are left destitute. The dairy has the faculty of enriching the farm by increasing the soil fertility and it is gratifying to note that more counties are paying attention to this important branch of live stock. We can feel sure that the dairy industry has gained in permanency by the

use of the silo. The silo is going to make it possible for the average farmer to figure how he can take care of his stock, and this assurance, that he has sufficient feed stored up is one of the greatest incentives to get into this line of business. For there is not any branch of live stock that suffers more intensively when there is a shortage of feed. As soon as the feed comes short, there is also a shrinkage in dairy products on account of the milk.

It is gratifying to note that the last few years the draft horse industry of our State has been very successful and has been one of the best money makers for our farmers of Illinois. For the farmers have found that a good mare can work almost a year and then produce a colt, which at weaning time is worth $100.00 or more, and the indications are that this practice may continue for some time.

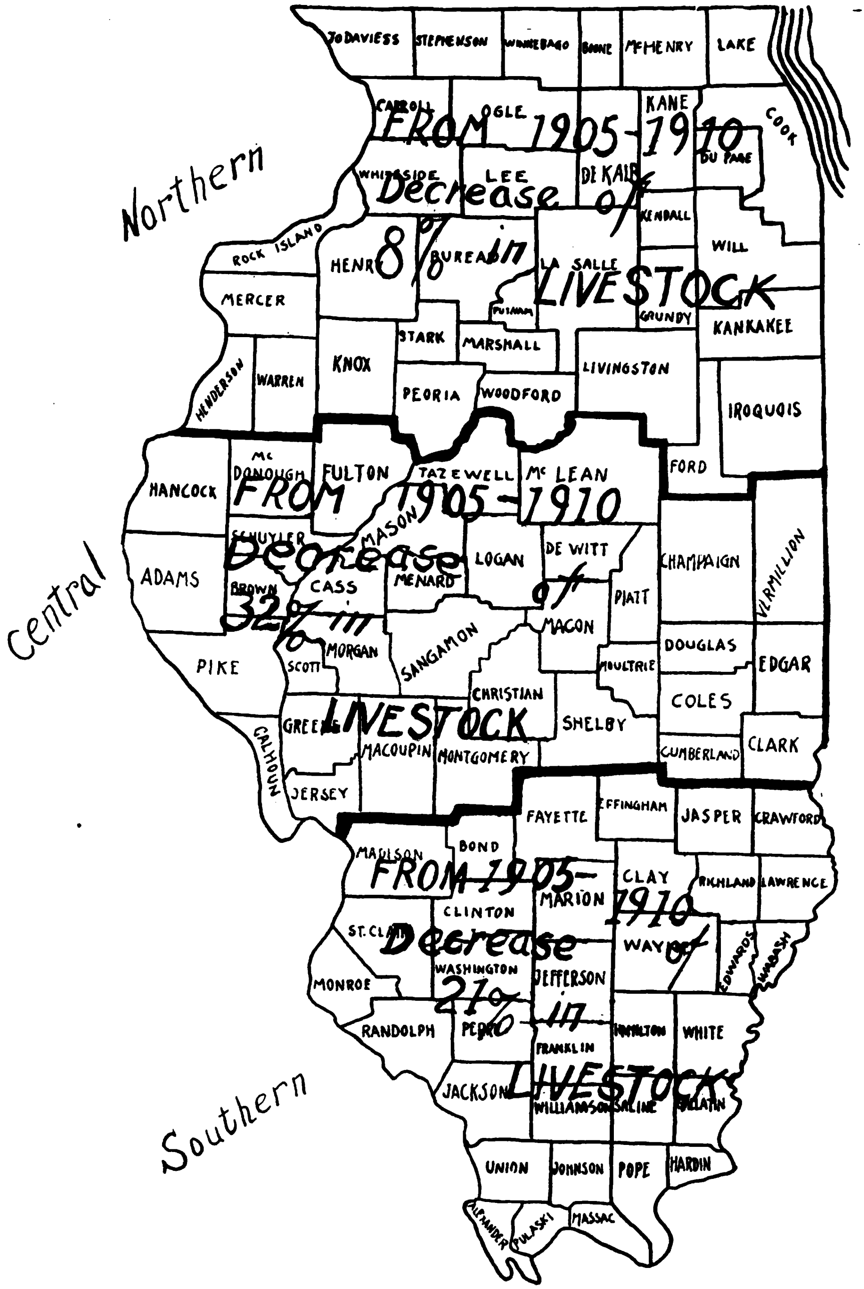
The sheep industry of our State is not what it should be, but the farmers who have grown a few sheep each year are securing recruits in their neighborhood. Sheep are a very valuable adjunct to the farm, for it is said that they return 80 per cent for what they receive, back on the farm. Therefore it seems only rational that a few sheep could be kept on every farm to take up the waste feed.

I emphasize again, teach your boys and girls to study the market and the conditions from all angles, and I predict that you will have very few of the boys so uninterested as to want to leave the farm.

The farmer should study feeding conditions. He should not only study the kind of animals he wants to feed, but he should study the feeds that are available on his farm and know the advantage of one feed over another, and what reasonable returns he may expect therefrom. This can all be procured for the asking. If he wishes to feed cattle, hogs, sheep or horses or dairy cows, he only need write the University and they will furnish him with good literature on any of these subjects.

I want to again say that it is important not to neglect this and not have the farmer do his own experimenting when there is an experiment station that will be glad to furnish him with the desired information.

Therefore, with the experiment station and with the outlook for good prices and the benefits that unquestionably can be derived from extensive animal husbandry on the farm, I hope that more and more farmers will seize the opportunity and grow their favorite kind of live stock and thereby become an important benefactor to the State of Illinois.


Northern
FROM 1905-1910
Decrease of
8% in
LIVESTOCK
Central
FROM 1905-1910
Decrease of
32% in
LIVESTOCK
Southern
FROM 1905-1910
Decrease of
21% in
LIVESTOCK
JO DAVIESS
STEPHENSON
WINNEBAGO
BOONE
McHENRY
LAKE
CARROLL
OGLE
KANE
COOK
WHITESIDE
LEE
DE KALB
DU PAGE
KENDALL
ROCK ISLAND
HENRY
BUREAU
LA SALLE
WILL
MERCER
PUTNAM
GRUNDY
KANKAKEE
STARK
MARSHALL
KNOX
HENDERSON
WARREN
LIVINGSTON
PEORIA
WOODFORD
IROQUOIS
Mc DONOUGH
FULTON
TAZEWELL
Mc LEAN
FORD
HANCOCK
MASON
SCHUYLER
ADAMS
LOGAN
DE WITT
CHAMPAIGN
VERMILLION
BROWN
CASS
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MACON
PIKE
SCOTT
MORGAN
SANGAMON
MOULTRIE
DOUGLAS
EDGAR
CHRISTIAN
COLES
GREENE
SHELBY
CALHOUN
MACOUPIN
MONTGOMERY
CUMBERLAND
CLARK
JERSEY
FAYETTE
EFFINGHAM
JASPER
CRAWFORD
MADISON
BOND
CLAY
RICHLAND
LAWRENCE
MARION
CLINTON
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WAYNE
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State Board of Live Stock Commissioners of Illinois

Bulletin No. 7, August, 1913.

Hog Cholera and Serum Vaccination

STATE HOUSE
Springfield, Illinois

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1913

ulcers, which are so deep that they may penetrate the walls of the intestines. The pancreas is swollen and somewhat caseous. Ulcers are found on the tongue and larynx. In some cases the lungs are inflamed. The spleen is enlarged, soft, and gorged with blood. It may be many times as long as the normal spleen. The lymphatic glands are usually affected. The kidneys are usually the seat of extensive hemorrhagic changes. Chronic cases of hog cholera are distinguished from tuberculosis by the fact that in hog cholera the diptheritic patches in the intestines do not calcify but become caseated on the edges, and dry and brittle in the center, while ulcers in tuberculosis calcify.

When the respiratory organs are the seat of the disease, the pleural cavity will contain a greater or less quantity of serum, which in some instances will be flaky as a result of coagulation. The pleura may present all the characteristic appearances of pleuritis. In some cases the lungs become hepatized to a greater or less extent. The exudate found in the air cells and bronchial tubes will vary in color and usually presents a frothy appearance. The trachea and larynx frequently present inflammatory appearances. The pericardium which covers the heart is almost always found congested, and contains more or less serum. The lymphatic glands are usually involved. Usually two kinds of pneumonia are found, lobar and catarrhal. The nature of the lung disease will depend to a large extent on how the virus gained entrance. If it entered by way of air tubes it is most likely that we shall have a bronchial pneumonia. If it entered the lung tissue through the circulation, then we shall have more or less scattered pneumonia.

TREATMENT.

For hog cholera there is no sure cure, and therefore preventive measures should be used. A great deal of good can be done by good sanitary regulations and by good feed. Feeding balanced rations that supply all the nutriments that the animal requires, will aid in warding off these diseases. It is of great importance to remember that the disease is caused by distinct germs and is highly contagious; therefore one should bear in mind that they can be warded off by preventing the bacteria from gaining entrance on the premises, and for this reason one should avoid visiting on a farm where he has any suspicion that hogs are dying from one cause or another, and, above all, should avoid purchasing a hog or hogs from a herd in which animals have recently died, for in that way he will bring the disease on his farm. Animals should not be thrown into streams, and the streams should be carefully guarded so that they will not be the source of spreading this disease through a great part of the country. It is known that virus can be carried on feed, implements, and shoes and clothing of the attendants who are taking care of the hogs. Dogs, buzzards, and the like can carry this disease. A dog from a neighbor should not be allowed on the farm when there is any suspicion of hog disease on his farm. As soon as the disease is noticed in a herd, it is well to divide the herd carefully into two or more groups. In this way you may check the disease and not lose more than one group, and prevent it from occurring in the rest of the herd. It is needless to say that these pens should be kept thoroughly clean, using such disinfectants as lime water or corrosive sublimate. When an animal has died, the carcass should be immediately burnt. It is not advisable to bury the carcass of cholera hogs, for very often a few years after they have been buried, hogs may have the opportunity to root them up, and in this way a fresh outbreak of cholera may occur. It is known that after hogs have been buried for a period of eight to twelve years, when that ground was brought to the surface it was still capable of producing hog cholera. The premises should be thoroughly disinfected. All dirt should be removed from the pens. The manure can be taken directly to the fields and plowed under, but should not be left exposed near the hog pens, for this is often the source of reinfection a year later. After all the dirt and litter has been removed, use one pound of carbolic acid crystals in about four gallons of hot water and thoroughly spray the woodwork with this solution, and then give it a coat of whitewash. Be careful not to turn hogs that have recovered from hog cholera in with the rest of the herd too soon; several months should elapse before doing this. Quarantine each hog that you purchase for at least three weeks, and during the time that he is in quarantine it is well to disinfect him thoroughly, either by spraying or dipping him several times before allowing him to be with the herd. Be careful to avoid all communication with any one whom you suspect has been in cholera pens, or on a farm where hogs suffer with some disease, no matter what name they apply to it.

The treatment of sick animals should be as follows: Above all, avoid too much feed while the animals are ailing, keep the troughs clean, do not allow the food to become sour, giving them just as much as they will clean up. As stated, there is very little that can be done with medicinal treatment, but by separating the sick from the well, and feeding the well ones sparingly, keeping plenty of disinfectants before them, and feeding very little to the sick ones and keeping them quiet, beneficial results will follow.

HOG CHOLERA SERUM.

Immune hogs from which you wish to obtain serum may be prepared for bleeding in four different ways, that is, by the slow method, by the quick method, intravenous injection and intra-abdominal injection. After a hog has been treated by one of these methods, it is known as an hyperimmune. The slow method consists in giving the hogs three increasing doses of virulent blood, which is injected under the skin, at intervals of seven to ten days. It takes about a month to produce an hyperimmune by the slow method. The quick method consists in injecting a very large amount of diseased blood at one time. The intravenous method consists in injecting virulent blood in small doses into the vein. These hogs are ready to be bled a week after the close of the preparation treatment. Serum intra-abdominal injection is done by injecting a large amount of diseased blood direct into the abdominal cavity.

The hog, after being placed on a table, the tail is thoroughly washed with an antiseptic solution and lukewarm water and soap, and then with a weak solution of alcohol. Before preparing the hog, bottles are sterilized and covered with cloth, which has also been sterilized. The rump is covered with a cloth, so that no dirt can fall into the bottle. A piece of the tail is amputated and in this way the blood is drawn from the hog. From a hog weighing 150 pounds, about three pints of serum is obtained at one bleeding. A hog can be bled four times before he has to be hyperimmunized again. The blood received in this way is defibrinated, and a small amount of carbolic acid is added to preserve it, and yet not injure its protecting power. The blood is then ready for use. A hog weighing 150 pounds will yield from 90 to 100 doses of serum at one bleeding. A hog can be bled once every eight or ten days. The above methods of preparing the serum are according to the government directions.

The dose of serum recommended is as follows, the amounts being given in cubic centimeters:

Under 50 pounds	20 c. c.
Under 75 pounds	30 c. c.
Under 100 pounds	35 c. c.
Under 125 pounds	40 c. c.
Under 150 pounds	45 c. c.
Under 200 pounds	50 c. c.
Under 250 pounds	55 c. c.
Under 300 pounds	60 c. c.
Under 350 pounds	65 c. c.
Under 400 pounds	70 c. c.

The dose of virus recommended is as follows, the amounts being given in cubic centimeters:

Small pigs	¼ c. c.
Under 50 pounds	½ c. c.
Under 75 pounds	¾ c. c.
Under 100 pounds	1 c. c.
Under 125 pounds	1¼ c. c.
Under 150 pounds	1½ c. c.
Under 200 pounds	2 c. c.

We do not recommend more than 2 c. c. in any instance.

WHAT THE OPERATOR SHOULD KNOW ABOUT VACCINATION.

First—The operator should never treat a herd of hogs with the simultaneous method unless the herd is in immediate danger.

Second—He should be thoroughly familiar with applying the serum and virus.

Third—He should have the necessary instruments that will insure his success, namely: Two glass barrel syringes, one a 20 c. c. syringe and the other a 2 c. c. syringe.

Fourth—The injection should be made deep into the muscle. Never should a subcutaneous injection be made.

Fifth—After injection the skin should be thoroughly disinfected with a solution of tincture of iodine.

A WARNING TO PERSONS RECEIVING SERUM.

Serum sent by the State Laboratory is properly chilled so that it will remain cool even on a summer day for some length of time. Serum when received from the express office should immediately be placed in a cool place to assure it remaining as cool as possible. Whenever the operator opens up the bottle of serum and it should pop, indicating that it has formed gases, then the serum has spoilt in transit and should not be used. If used it will cause large abscesses and a great loss in the herd through poisoning. Carelessness on the part of the operator handling the serum is largely responsible for bad results.

ABSCESSES SHOULD NOT OCCUR.

Abscesses after vaccination are the fault of poor vaccination and not the fault of the serum. These abscesses may occur by the operator not injecting the serum deep enough into the muscle or the serum may have spoilt while in the care of the owner. This is not a fault of the serum or the method but the fault of the operator and therefore can be avoided.

HOW TO TAKE CARE OF THE SERUM.

In the winter time when serum is used, and the temperature is around zero it is advisable to warm to about blood heat just before using. In the summer time this should be reversed, it should be as cool as possible, because it will easily spoil when allowed to stand in the sun or in a warm room.

WHERE TO VACCINATE.

Ordinarily it is best to vaccinate on the inside of the fleshy portion of the ham. By this is meant that the needle is inserted deep into the muscle. Never make a subcutaneous injection, which means just between the skin and the flesh. Vaccinating behind the ear is not desirable and should never be used when the serum and virus is used for absorption takes place more slowly when injected there. Injecting between the forelegs can be done but I do not think it is as desirable a location as injecting into the muscle.

TREATMENT OF A SICK HERD.

A sick herd should be treated with serum as soon as possible. All animals should be subjected to the fever test by using a thermometer.

The temperature is taken by inserting the thermometer into the rectum of the hog and allow it to remain there for a full minute, this can be done by placing the animal in a crate or by having the animal held for that length of time. Care should be taken that the scale of the thermometer is shaken down each time to be sure that you are securing the right reading from each hog. In our work we find a bulb veterinary thermometer seems to give good results, because it can be more easily inserted; the thermometer is different from the ordinary ones on the market. These thermometers can be secured from any instrument house. This department considers the animals normal that have a temperature between 100 and 103. All animals having a temperature above this are considered abnormal and should be looked upon with suspicion. Animals with the high temperature should receive the serum alone. They should be properly marked so as to identify them in case of loss. Animals with a normal temperature should receive serum and virus according to the directions given.

SERUM ALONE METHOD.

The serum alone method consists of using potent serum which is injected with a hypodermic syringe into the muscle of the ham. The immunity conferred by this method is very slight. Observations have taught us that it seems to only protect for a period of two weeks, seldom five weeks. On account of this slight immunity it does not seem that it should be used to any large extent as a preventive. There is no danger in using serum alone for the serum alone cannot produce the disease in a susceptible hog but, as stated, it has also failed to give the desired immunity. On account of the high cost of the serum one is not justified in using it only in a sick herd when it is found that possibly eight or ten animals in the herd have a slight temperature. Then one is justified in using the serum on these animals and the double method on the remaining animals for it gives them permanent immunity which the serum alone does not.

SERUM ALONE USED IN A SICK HERD.

It was taught that when serum alone was used in a sick herd that the animals which received the serum alone treatment would be exposed to the disease by allowing sick animals to run with them and in this way they would receive permanent immunity that would be equivalent to the double method. Our experiments have taught us that this is not reliable and after exposing numerous herds in this way we have come to the conclusion that one cannot with safety regard these hogs so treated as permanently immune for a great number of these hogs when again exposed a reasonable time after treatment would again take the disease. Therefore we have not recommended this method. Further, it is not a safe and sane sanitary measure to advocate. Allowing diseased animals on these premises for a long time is sure to assist in spreading the disease in that community.

SERUM SIMULTANEOUS METHOD.

The serum simultaneous method should be used as a preventive giving according to directions the amount of serum and virus. It is always advisable when in doubt to use the thermometer to be sure that these hogs are free from infection because hogs injected with serum and virus that should have a high temperature are sure to become very sick and many of them may die from the effects. Serum and virus used properly will protect and give a permanent immunity to the hogs through the rest of their lives.

WHEN TO USE THE SERUM SIMULTANEOUS METHOD.

The serum simultaneous method should never be used on a herd when it is not in immediate danger. By that the department means that a herd should not be treated unless it seems reasonably certain that this herd will not escape infection. Then one is justified in treating this herd by this method and if a loss should occur it would be far less than the natural infection would be. Hogs treated by the simultaneous method should be watched for ten days after the treatment. If they seem to come down with the disease then it will be well to inject them with another quantity of serum which seems to act as a stimulant and is of great value in lessening the loss from vaccination.

Treating Sows.

Great care should be taken in treating sows. It seems that sows can be treated with safety a few weeks after being bred. Sows in advanced period of gestation cannot be treated with safety by the double method. There is not so much danger of them dying from the effects of the vaccination, as it is causing them to abort, or if they do not abort the offsprings will come in a very weak condition and this results in a loss to the owner.

How to Treat Sows.

Sows, therefore, should be treated only when it seems that they will not escape from becoming infected with cholera, then one is justified in treating them and if he loses a large per cent of the pig crop he has saved the sows. My experience with the single method has been, that if it is given, it has to be given to them at least every three or four weeks until the infection has disappeared, otherwise they do not seem to be immune. The treatment of little pigs, if infection is on the farm and sows have been immunized, then I would not advise treating the little pigs until weaning time. For our experience has been that they seem to be immune until that time. Then if infection remains on the premises or in the neighborhood one might be justified in treating them.

Vaccinating Little Pigs.

Little pigs vaccinated with the simultaneous method weighing twenty pounds will outgrow their immunity and should not therefore be treated unless absolutely necessary. Shoats weighing from sixty to eighty pounds when given the double method seem to receive a permanent immunity.

Feeding Hogs After Vaccination.

The animals will have a rise of temperature if treated with the double method for a number of days, therefore it is advisable to feed such feeds that are not too heating in the summer time, green feed such as pasture is advisable, slop made from middlings to which some oats has been added. This will keep the bowels in a laxative condition. Care should be exercised not to feed too much so that it will cause the excrement becoming too soft. If this is noticed, then the water in the slop should be reduced.

HOW HOGS ARE TO BE HANDLED WHEN YOU ARE GOING TO VACCINATE.

Make an appointment with your veterinarian for a stated time when you are going to perform this operation. In the summer time it is best to vaccinate as early in the morning as possible to avoid the heat. It is always advisable to have the animals in a corral that is dry and free from dust as much as possible, and secure plenty of help, so that it can be done in a short time, without unduly fretting the animals. See that the fences are secure so that the animals cannot break out. Place them in as small a pen as possible to avoid driving them around very much when they are to be caught. Animals should be as dry and clean as possible when the vaccinating is performed. When they are dry it is only necessary to rub the parts where you are going to insert the needle with a good brush and a piece of cloth, and applying tincture of iodine after injection. When these precautions are exercised it will greatly assist in performing the operation and will reduce the danger of having overheated and exhausted animals.

HOW TO DISINFECT YOUR FARM.

If hogs are all sick on the farm when you are treating the herd, it is well to burn all carcasses because this insures the best means of disinfection. The barns and pens should be washed with a strong solution of dip or whitewash to which crude carbolic acid or dip has been added. Sunlight being the best disinfectant it is therefore necessary to see that all parts of buildings are given a sun bath if possible. All litter and rubbish should be collected in wheelbarrows and place on one pile and there burned.

HOW TO BURN UP CARCASSES.

An easy way to burn up carcasses is as follows: Dig a trench two feet wide and eighteen inches deep, lay across several pieces of iron so as to form a grate. Throw a little straw underneath and start your wood or cobs under this grate. In this way you will in a short time effectually burn up the carcasses without having the annoyance of the carcasses smothering out your fire. The trench has this advantage that you can always feed the fire with ease and make it just as hot as you desire. It also prevents having the disagreeableness of smudges. This trench can be built in a few minutes and all carcasses that are to be destroyed should be dealt with in this way.

DISINFECTANTS.

A cheap disinfectant is plenty of whitewash to which either dip or crude carbolic acid is added. Another cheap disinfectant which is recommended by the government, is liquor cresolis. This has the disadvantage that it does not mix freely with water, but it is a very good disinfectant and seems to be highly recommended by the government in their official test. Another effectual disinfectant is the residue from the gas works. This can be secured by those living near a village that have a gas plant. Take it home in barrels or cans, this makes a very good disinfectant. Most all of the dips advertised have a disinfectant value. These ingredients should be sprayed on by an ordinary spray pump suitable for disinfecting stables. These pumps can be used for spraying trees or other things around the farm and every farm should be equipped with one of these pumps. The surfaces, such as ceilings, walls, partitions and floors, of course, should be swept clean of all rubbish before the disinfectant is applied. This material should be placed on a pile inaccessible to live stock so as to avoid reinfection. If it cannot be burned it should be mixed with a solution of chloride of lime, in the proportion of six to seven ounces to one gallon of water. Where the surfaces have been stained by urine for any considerable length of time, they should be thoroughly scraped to a depth of several inches. Soil should be raked and treated with the same solution. The walls of these stables and pens, especially where hogs have been kept should be disinfected to the height of from three to four feet at least.

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